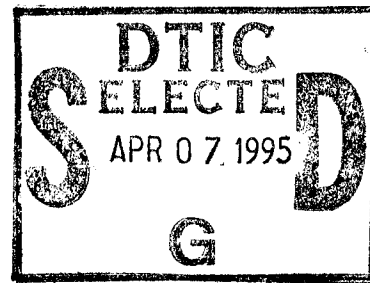


NAVAL POSTGRADUATE SCHOOL  
Monterey, California



**THESIS**



USING MARGINAL ANALYSIS  
TO LOAD COMBAT LOGISTICS  
FORCE (CLF) SHIPS

by

K. Craig Wilson

December 1994

Principal Advisor:

P. J. Fields

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FORCE (CLF) SHIPS

by

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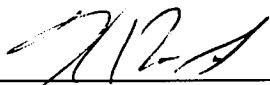
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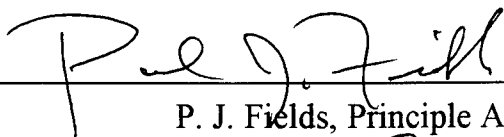
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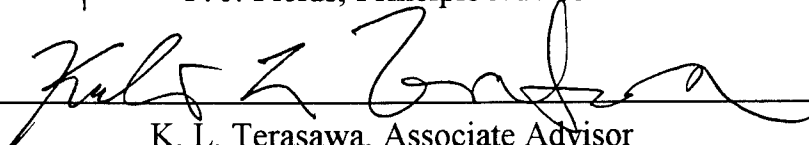


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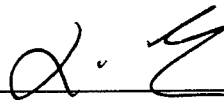
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## ABSTRACT

This thesis provides an algorithm based on marginal analysis to help CLF Supply Officers load ships with Provisions (food), High Usage Load List (HULL), and ship store stock. The algorithm is incorporated into an EXCEL spreadsheet and produces a prioritized list of items in their optimum stocking sequence. The algorithm is compared to both the Atlantic and Pacific Fleet current loading methods using a food item example and shows a 60-70% increase in expected supply effectiveness. Furthermore, the algorithm is generic and can be applied to any inventory problem where a demand distribution is known and space is the limiting factor in determining stocking levels.



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## LIST OF ACRONYMS AND ABBREVIATIONS

|                |  |
|----------------|--|
| AMD            | Average Monthly Demand                               |
| AO             | Fleet Oiler  |
| AOE            | Multi-commodity CLF ship                             |
| AOR            | Area of Responsibility or Multi-commodity CLF ship   |
| CARGO          | Consolidated Afloat Requisitioning Guide Overseas    |
| CDF            | Cumulative Distribution Function                     |
| CLF            | Combat Logistics Force                               |
| COMLOGWESTPAC  | Commander Logistics Group, Western Pacific           |
| COMNAVSURFLANT | Commander Naval Surface Forces, U. S. Atlantic Fleet |
| CONUS          | Continental United States                            |
| FILL           | Fleet Issue Load List                                |
| FMSO           | Fleet Material Support Office                        |
| HULL           | High Usage Load List                                 |
| LSD            | Amphibious Dock Landing ship                         |
| NEXCOM         | Navy Exchange Command                                |
| NAVFSSO        | Navy Food Service Support Office                     |
| pdf            | Probability Distribution Function                    |
| SPCC           | Ships Parts Control Center                           |
| T-AFS          | Military Sealift Command Fast Combat Stores Ship     |
| WESTPAC        | Western Pacific                                      |



## I. INTRODUCTION

In the private sector and in shore based military situations, inventory models are typically designed to minimize total inventory cost by balancing the cost of holding inventory against the cost of not having inventory on hand when it is needed. The holding cost is normally a combination of capital, insurance, obsolescence and deterioration costs. The cost of not having an item is measured in lost sales, reduced goodwill and lost production (private sector) or operational time (military).

Inventory decisions for ships and other mobile units follow the same basic principle of considering the trade-off between holding and stock-out costs. However, balancing these costs may not always be useful because the stock-out costs can far outweigh the holding costs. As a result, the optimal quantities determined by the usual method may exceed the amount of on-board space available. This is particularly true when determining inventory quantities to be loaded on Combat Logistics Force (CLF) ships. The CLF ship acts as the principle source of supply for deployed combat ships and units, so the CLF Supply Officer's objective is not cost minimization, but rather customer service maximization. The relevant constraint to maximizing customer service is the total space available for holding inventory.

The material carried on CLF ships is classified into five commodities: Fleet Issue Load List (FILL) material; provisions (food); ship's store merchandise; High Usage Load List (HULL) material; and petroleum products (AO Deckload). The itemized lists of this material is published in the Consolidated Afloat Requisitioning Guide Overseas (CARGO) and is maintained by the Ship's Parts Control Center (SPCC), the Fleet Material Support Office (FMSO), the Navy Food Service Support Office (NAVFSSO) and the Navy Exchange Command (NEXCOM).

The stocking quantities and reorder policies for FILL inventories are determined by SPCC by operational analysts who strive to determine optimal inventory levels.

However, the other commodities are controlled at the operational staff and shipboard level by personnel who frequently lack the expertise to make appropriate stocking decisions.

In the recent past, Pacific CLF ships have been deployed almost exclusively to the Persian Gulf and Atlantic CLF ships have had a regular deployment schedule to the Mediterranean Sea. This resulted in the development of stable logistics pipelines and a regular re-supply schedule. If the CLF deployed with a poor mix of material, the initial load could be supplemented by re-supply. The nature of current operations are less predictable. They often do not last long enough to set up re-supply pipelines. These dynamic operational situations will likely continue in the future.

During the cold war, it was U. S. Navy policy to keep inventory levels in excess of lead time demand on CLF ships because, if a war were to breakout with the Soviet Union, our re-supply pipelines would be disrupted. The CLF would be forced to operate without re-supply. Now the same idea is also sound, but for a different reason. Today's political environment produces limited conflicts which can happen anywhere in the world and typically last a year or less. These short operations are often completed before a re-supply pipeline can be established. In this logistics environment, the inventory problem is to find the right mix of products to carry, in order to satisfy the maximum number of customer demands constrained by the CLF ship's storage capacity.

Procedures for determining the amount of non-FILL material to load for a deployment are currently not standardized throughout the Navy. Guidance is frequently passed informally from ship to ship or from staff member to staff member resulting in inconsistent and often poor fleet customer service due to stock outs. Tools are needed to assist the CLF supply officer and the operational staffs to make stocking decisions which will maximize customer satisfaction.

The total amount of material to be carried on the CLF ship is not usually in question. The real decision is, "How much of the available space should be allocated to each item?" Therefore the quantity loading decisions are based on how the loading of a

particular item will help the ship accomplish its mission goal of filling customer demand. For example, if the CLF ship has room for only one case of frozen food and the Supply Officer can choose between a case of chicken or a case of Brussels sprouts, he or she should choose the item that will increase the ship's chances of satisfying the most customer demand during a support period. That is, if chicken is more likely to be ordered than Brussels sprouts, the Supply Officer should load a case of chicken.

This thesis advocates using marginal analysis as a tool to assist the CLF Supply Officer in making these loading decisions. The vehicle proposed to exploit marginal analysis is an algorithm programmed into an EXCEL spread sheet. The marginal benefit that an inventory item adds to a ship's mission is an appropriate means to compare items for stocking consideration. In order to determine the marginal benefit that a carried item adds to a CLF ship, a utility function must be defined. On a CLF ship, utility can be measured in terms of the ship's performance statistics. The critical statistic is called "Supply Effectiveness." Net supply effectiveness is defined as the number of requisitions filled by the ship divided by the total number of valid requisitions received by the ship. The proposed algorithm uses the expected increase in performance for each incremental increase in an item's stocking level to determine the mix of items that will maximize customer satisfaction.

Chapter II provides a detailed background discussion of the operational logistics environment in which CLF ships operate including the current methodology and procedures which determine the loading of CLF ships. Chapter III explains the theoretical framework for determining the loading sequence of a CLF ship given commodity demand distributions and a space constraint. Chapter IV develops the algorithm and uses actual CLF demand data from WESTPAC ships to illustrate how a spreadsheet based on the algorithm can be used as a decision making tool. Chapter V concludes the thesis with a summary of the algorithm's performance and offers recommendations for how the algorithm can be used.



## **II. BACKGROUND**

### **A. CLF SHIP OPERATIONS**

Atlantic and Pacific Fleet CLF ship operations are different in many respects, but many general practices apply to both. Many strides were made in recent years in fleet standardization and it is a continuing effort. Requisitioning procedures have been standardized and both Fleets carry the same line items. Operational disparity remains because of the geographical contrasts of the two oceans that dominate each fleet's operational areas. The Pacific theater's long logistical distances provide a less flexible operational environment while the short distances encountered in the Mediterranean Sea allow for more flexible use of CLF assets. For example, one Atlantic Fleet T-AFS can simultaneously service a battle group operating off the coast of Israel and one operating in the Adriatic Sea. A Pacific Fleet T-AFS cannot simultaneously service a battle group in the Indian Ocean and one in the Persian Gulf. The Area of Responsibility (AOR) in the Pacific is so large that distances limit logistics flexibility. This difference in flexibility has historically created two separate CLF philosophies, the station ship and the shuttle ship philosophies.

The station ship philosophy has the CLF ship steaming with the battle group and only leaving the operational area for a short time. A shuttle ship steams with the customer ships when providing direct support. But, it leaves the battle group to serve other customers or returns to a shore logistics site to load supplies. The Pacific Fleet historically has operated under the station ship philosophy because the ability of one CLF ship to support geographically separated battle groups was limited. The shuttle ship philosophy was dominant in the Atlantic Fleet because one CLF ship could realistically go from one battle group to another and provide support. During Desert Storm, the concentration of ships in the Persian Gulf allowed the Pacific Fleet to use the shuttle ship philosophy also. The shuttle ship philosophy is dependent on a resupply point to maintain stock levels on the primary CLF asset. Because of the dynamic world environment,

resupply pipelines are frequently not dependable and so the station ship concept is likely to emerge as the dominant strategy used in future operations. Current ship building efforts, USS SUPPLY (AOE-6) class, are designed around a station ship concept.

Both Atlantic and Pacific Fleet operational staffs provide loading guidance to CLF ships, but most effort is directed towards T-AFS class ships which are the workhorse of the Combat Logistics Force. The following two sections describe the guidance the staffs provide for these units. In the future, the other ship types of the CLF will increase in importance and new guidance will have to be developed to better load these ships. Currently, the other ship types are being loaded in an ad hoc manner and little data is available to evaluate the performance of the loading process.

## **B. CURRENT METHODOLOGY (ATLANTIC FLEET)**

Atlantic Fleet CLF operations have almost exclusively centered on the Mediterranean Sea during the time of the Cold War. The major exceptions to this have been short exercises to the North Sea and sharing duties with the Pacific Fleet during Desert Storm. This stable environment has enabled the Atlantic Fleet staffs to establish reliable transportation pipelines and local sources of supply to assist the CLF ships in the Mediterranean. In this situation, initial loading of the CLF is important but not as critical as it would be with out this infrastructure. However, the ability to maintain this pipeline has depended on the availability of excess CLF assets. Currently, CLF assets are scarce so a pipeline from CONUS is not in place. According to Commander Naval Surface Force Atlantic (COMNAVSURFLANT) staff, a T-AFS is loaded in Norfolk, Virginia for an 86 day period of support in the Mediterranean and then is replaced by the next CLF ship in the rotation. Less capable CLF units such as AOE and AOR ships deploy with the battle group and fill gaps in T-AFS support.

COMNAVSURFLANT assists Atlantic Fleet CLF Supply Officers when they load their ships for deployment. A simple 12 month average is used to set the load quantities

and judgmental adjustment is made for intuitively seasonal items such as hot chocolate, ice cream and holiday foods. Hueristics are used to determine the stocking objectives in conjunction with the Average Monthly Demand (AMD) figures. For example, if one battle group is the anticipated customer base, 210% of AMD is the stocking objective. If the anticipated customer base is two battle groups, 310% of AMD is the objective. The reasoning behind this level setting is to treat 200% or 300% of AMD as the base inventory and 10% as the safety stock. This method is successful when demand is steady and the customer base is known, but COMNAVSURFLANT staff indicates that demand spikes are common and experience has shown these spikes can cause serious problems.

### **C. CURRENT METHODOLOGY (PACIFIC FLEET)**

Pacific Fleet operating areas have been much more diverse than those of the Atlantic Fleet. Since 1990, Pacific Fleet battle groups and their CLF assets have operated in the Persian Gulf, off the coast of Bangladesh and Somalia and in operating areas near Australia and Korea. This unpredictable operational environment calls for the CLF ship to deploy fully loaded and makes stable logistical pipelines difficult to establish.

Commander Logistics Group, Western Pacific (COMLOGWESTPAC) assists Pacific Fleet CLF Supply Officers when they load out for deployment. Loading guidance is provided via Commander Logistics Support Force Seventh Fleet Notice 4423. The standard load is based on the most recent 12 months of demand data. The standard load is computed by finding the median of the demand data and then multiplying it by 3 to get a 3 month load. The median is used rather than the mean, because when the mean is used the T-AFS's storage space is often exceeded. The standard load for the Pacific Fleet is designed to be starting point for the loading process. The Supply Officer is expected to take the standard load and then adjust the totals up or down using additional customer information or his or her own experience. For example, the standard load may indicate that 1000 cases of individual canned juice should be loaded, but the battle group Aircraft

Carrier may have indicated that juices will be used for flight box lunches and it will need 3000 cases during the deployment. The CLF Supply Officer then adjusts the standard load accordingly

#### **D. PROBLEM**

CLF ship's Supply Officer, with assistance from operational staffs, load CLF ships with Food, Ship's Store material and High Usage Load List material without standardized guidance or inventory modeling tools. In the past, this has caused the following problems:

1. Customer service, measured by the ability to fully satisfy customer demands, has been inconsistent.
2. CLF ship Supply Officers have been forced to rely on secondary local sources of supply that were more expensive and of lesser quality than primary established sources when the initial load failed to satisfy customers during the support period.
3. Unexpected material shortages have resulted in the use of expensive high priority transportation channels to satisfy customer needs which the CLF ship was unable to meet.

The above problems have not been critical to logistics operations prior to the fall of the Soviet Union for two reasons. First, the stable operations which were characteristic of the cold war made it possible to adjust loads using established resupply pipelines to cover initial loading mistakes. Second, ample transportation dollars existed to expedite material shortages therefore minimizing the impact of shortages to the customer.

Today's unpredictable operating environment and stringent fiscal climate make the initial loading of the CLF essential to the success of its mission. Therefore, it is imperative that Supply Officers responsible for loading the CLF ship have the tools available that will assist them in maximizing customer satisfaction while efficiently using financial resources.

### III. MODEL DEVELOPMENT

#### A. OBJECTIVE

The goal of this thesis is to develop a model that will help determine the optimum mix of material to be carried on a CLF ship. The objective of the model is to maximize the CLF ship's performance during a given period of support. The primary measure of CLF ship performance is called Supply Effectiveness. It measures the level of customer support which is provided to the deployed combat ships and units assigned to the CLF's operating area.

#### B. DEFINING A PERFORMANCE MEASURE (SUPPLY EFFECTIVENESS)

Supply effectiveness is currently defined as:

$$\text{Supply Effectiveness \%} = \frac{\text{Number of Requisitions Filled}}{\text{Total Number of Requisitions Received}} \times 100 \quad (3.1)$$

The number of requisitions filled includes partial requisitions filled. There is no distinction made between fully filled and partially filled requisitions.

However, this method of judging the performance of the CLF ship is not an accurate measure of customer satisfaction. The current method treats a partially filled requisition the same as a fully satisfied requirement. For example, USS FIFE submits a requisition to USNS SPICA requesting 10 cases of hamburger. SPICA transfers 5 cases to FIFE. Using the current effectiveness equation, the customer is considered fully satisfied, when in fact they were not. The current measurement provides an incentive to the CLF Supply Officer to manipulate the effectiveness percentages by increasing the number of

partially filled requisitions. For example, if the CLF ship is running low on a particular item, requisitions will be partially filled with small quantities to artificially boost the numerator in the supply effectiveness equation. This enables the Supply Officer to keep the supply effectiveness percentage at a point between 97 and 100% regardless of the amount of unsatisfied demand. Continually unrealistic effectiveness percentages have undermined the logistic commanders's confidence in the Supply Effectiveness performance measure and have caused more subjective measures of customer satisfaction, such as customer complaints, to dominate decision making. Objective and realistic performance measures are needed to evaluate stocking policies along with customer feedback.

This thesis proposes re-defining supply effectiveness based on units delivered vice requisitions filled or partially filled. The new measure will provide a more accurate measure of customer satisfaction because unfulfilled demand will be reflected in the percentage. The proposed equation for measuring Supply Effectiveness is:

$$\text{Supply Effectiveness \%} = \frac{\text{Units of Demand Satisfied}}{\text{Units of Demand Requisitioned}} \times 100 \quad (3.2)$$

### **C. APPROACH**

Inventory decisions are normally based on determining the least total cost of stocking alternatives. This is done by determining when to order and what order quantity produces the minimized sum of ordering costs, holding costs, and stock out costs. However, the situation on the CLF ship is somewhat different from the typical inventory scenario. Because of the operational considerations described in Chapter I, the CLF will usually order only once. The CLF stays on station as long as it is able to serve its customers and then must be either re-supplied by or replaced by another CLF ship. In this

situation, ordering costs are not a decision factor because it is a single order quantity problem. CLF material holding costs are negligible since the material has already been paid for by the Navy and if it is not being held on the ship it will be stored in a shore warehouse. Consequently, the only relative holding cost is the cost of unloading unused material after a deployment. Shortage costs on the other hand are extremely high because the CLF ship is the primary source of supply for deployed customer ships operating in an area thousands of miles from any other supply source. These costs consist of either one or a combination of: (1) the cost of doing without the material; (2) the cost of returning to port for more of the material; (3) The cost of commercial water transportation to the theater of operations; (4) The cost of airlifting material to the theater of operations. This situation if analyzed by the traditional means would always point towards a stocking level exceeding the CLF ship's storage capacity. Thus, storage space becomes the critical constraint.

To assist the CLF Supply Officer in making loading decisions, the thesis proposes an algorithm based on marginal analysis to allocate the ship's storage space. The algorithm prioritizes the loading sequence of each case of material on the basis of its expected increase to the CLF ship's supply effectiveness. The expected increase is derived from the probability of satisfying demand for each inventory item given the demand distributions developed from historical CLF demand data.

#### **D. MARGINAL ANALYSIS PRINCIPLES**

Marginal analysis is normally used to make inventory decisions based on the premise that adding one more unit of inventory will either increase or decrease profit (a measure of performance). The optimal inventory is found at the point where the last added unit of inventory produces an increase in profit but one more unit would produce a loss.

Tersine [Ref. 1], illustrates this by determining the optimum stock out level and then choosing the inventory quantity that is expected to provide this level of customer satisfaction. The equation he uses is:

$$P(s) = \frac{ML}{MP + ML + A} \quad (3.3)$$

Where:         $P(s)$  = Probability of stockout  
                  $1 - P(s)$  = Customer Service Level  
                  $ML$  = Marginal Loss  
                  $MP$  = Marginal Profit  
                  $A$  = Stock out costs

Although, this method is effective for single order inventory decisions in civilian industry, the loading decisions encountered on the CLF do not correspond to this model. While profit and loss are relevant performance measures for commercial operations, supply effectiveness is the relevant performance measure for military operations.

The model this thesis proposes does not attempt to compare inventory quantities in terms of money, but makes comparisons based on the expected increase in service level per cubic feet the material occupies.

## **E. ALGORITHM ASSUMPTIONS**

In developing the algorithm to assist the loading of CLF ships the following assumptions are made:

1. The distribution of future demand for each item will be similar to the historical demand pattern for each item.
2. The amount of space available on the CLF ship and the amount of space each item requires are known.
3. The relative importance of each item competing for the space is known.
4. Individual item demands are independent of each other.
5. Items are not directly substitutable.

## **F. ALGORITHM DEVELOPMENT**

The problem on the CLF is to determine an optimum load mix that will maximize the supply effectiveness of the ship while not exceeding the ship's storage capacity. The algorithm can best be explained by a simplified example of the CLF inventory problem containing only two line items. The Lagrange multiplier technique from calculus is used to solve this simplified problem. The solution that is derived is the foundation for the spreadsheet described in the next section.

### **1. The Example's Given Information**

- (a) Items are designated as items "A" and "B".
- (b) The variables in this example are defined as:

$F(X_A)$  is the cumulative distribution function of demand for item A.

$F(X_B)$  is the cumulative distribution function of demand for item B.

$S_A$  is the space required for one unit of item A.

$S_B$  is the space required for one unit of item B.

$X_A$  is the number of units of item A to be loaded.

$X_B$  is the number of units of item B to be loaded.

## 2. Problem Solution

*a. Step 1: Determine the objective and constraint equations to be used in the Lagrange optimization.*

The objective function can be thought of as the reliability of a system made up of serially aligned components. Each line item behaves like a component in the series, because if an inventory item fails to meet a customer demand it is treated as a failure to the system. In a serial reliability problem, the reliability of each component is multiplied together to achieve the overall reliability of the system [Ref. 2]. The "reliability" of each inventory item is the probability of being able to satisfy or exceed demand. This probability is represented by the cumulative distribution function,  $F(X)$ . The objective equation can be expressed as a generalized Cobb- Douglas function [Ref. 3]:

$$U = [F(X_A)]^{E_A} [F(X_B)]^{E_B} \quad (3.4)$$

where  $U$  represents the system "reliability", i. e., the supply effectiveness, and  $E_A$  and  $E_B$  are exponents that express the relative importance of each line item to the system.

The constraint equation states that the sum of storage space each item requires multiplied by the amount loaded must not exceed the total storage space available. The constraint is represented by:

$$S_T = S_A X_A + S_B X_B \quad (3.5)$$

where  $S_T$  represents the total storage space available.

***b. Step 2: Set Up the Lagrangian Equation***

The Lagrangian equation for this optimization is expressed as:

$$\mathcal{L} = [F(X_A)]^{E_A} [F(X_B)]^{E_B} + \lambda (S_T - S_A X_A - S_B X_B) \quad (3.6)$$

The Lagrangian multiplier,  $\lambda$ , can be regarded as the marginal supply effectiveness of an extra cubic foot of storage space.

***c. Step 3: Solve the Lagrangian Equation***

Solve the Lagrange equation by taking partial derivatives with respect to  $X_A$ ,  $X_B$ , and  $\lambda$  and setting them equal to zero. The following first-order conditions for a constrained maximum result:

$$\frac{\partial U(X_A, X_B)}{\partial X_A} + S_A \lambda = 0 \quad (3.7)$$

$$\frac{\partial U(X_A, X_B)}{\partial X_B} + S_B \lambda = 0 \quad (3.8)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = S_T - S_A X_A - S_B X_B = 0 \quad (3.9)$$

Equation (3.9) simply repeats the constraint equation.

*d. Step 4: Solve Equations (3.7) and (3.8) simultaneously for  $\lambda$ .*

$$\lambda = - \left[ \frac{\partial U (X_A , X_B)}{\partial X_A} \right] \quad (3.10)$$

$$\lambda = - \left[ \frac{\partial U (X_A , X_B)}{\partial X_B} \right] \quad (3.11)$$

$$\frac{\left[ \frac{\partial U (X_A , X_B)}{\partial X_A} \right]}{S_A} = \frac{\left[ \frac{\partial U (X_A , X_B)}{\partial X_B} \right]}{S_B} \quad (3.12)$$

Equation (3.12) states that the marginal supply effectiveness per unit of space must be equal for A and B at the optimum.

Although this method provides a means to find an optimal mix of material to be stored in a given space constraint, it can be impractical to implement. First, the cumulative probability distribution function cannot be evaluated analytically, so numerical evaluation is necessary. Second, it becomes too cumbersome when working with more than two items. Finally, if the space constraint changes, the problem must be recalculated. The typical decision faced on the CLF is to find the optimal mix of over 50 line items based on empirical demand data when space constraints are frequently changing.

This thesis proposes using the same principles illustrated in the above example in a spreadsheet algorithm that compares the ratios of Equation (3.12) for a multitude of line items simultaneously. Also, if the space constraint changes, the spreadsheet can be easily altered to recompute a new solution.

The optimum level for the Lagrange solution is found where the ratios are equal for each competing item. The algorithm numerically compares the evaluation ratios of each line item against each other over a range of stocking levels and sorts these ratios in descending order to identify loading quantities that have approximately equal ratio values. The ratios are not exactly equal due to the discrete nature of the loading decisions. CLF loading decisions are made in discrete units, such as cases or pallets. While calculus equates the ratios over a continuous range, the algorithm provides a means to equate the evaluation ratios over a discrete range.

#### **G. SPREADSHEET DEVELOPMENT**

The proposed algorithm compares each line item of stock and provides a step-by-step approach to evaluating the relative impact on supply effectiveness of each added case of material. A Microsoft EXCEL spreadsheet provides an easy-to-use means to implement the algorithm.

There are three types of spreadsheets used in the thesis. The first type calculates the ratios for each line items which are similar to Equation (3.12). The second type consolidates specific information from all the line item spreadsheets into one spreadsheet. The third type sorts information from the second type and provides a prioritized list for loading material.

The remainder of this chapter summarizes the spreadsheet algorithm by explaining what each sheet accomplishes and how the sheets are linked together to produce a decision making tool. A detailed explanation of the spreadsheets including column, row and cell interactions is provided in Appendix (A). An illustrative example of the implementation of the spreadsheet algorithm is provided in Appendix (B).

The first goal of the algorithm is to produce a cumulative demand distribution function for each line item of material to be loaded. The example uses six log normally distributed line items. By converting the raw data to their natural logarithms, the data can

be treated as being normally distributed and a cumulative distribution for the normalized data can be created. One of the example's line items, french fries, is a representative illustration of the shape of the normal cumulative distribution function (Figure 3.1).

## Estimated C D F

For French Fries

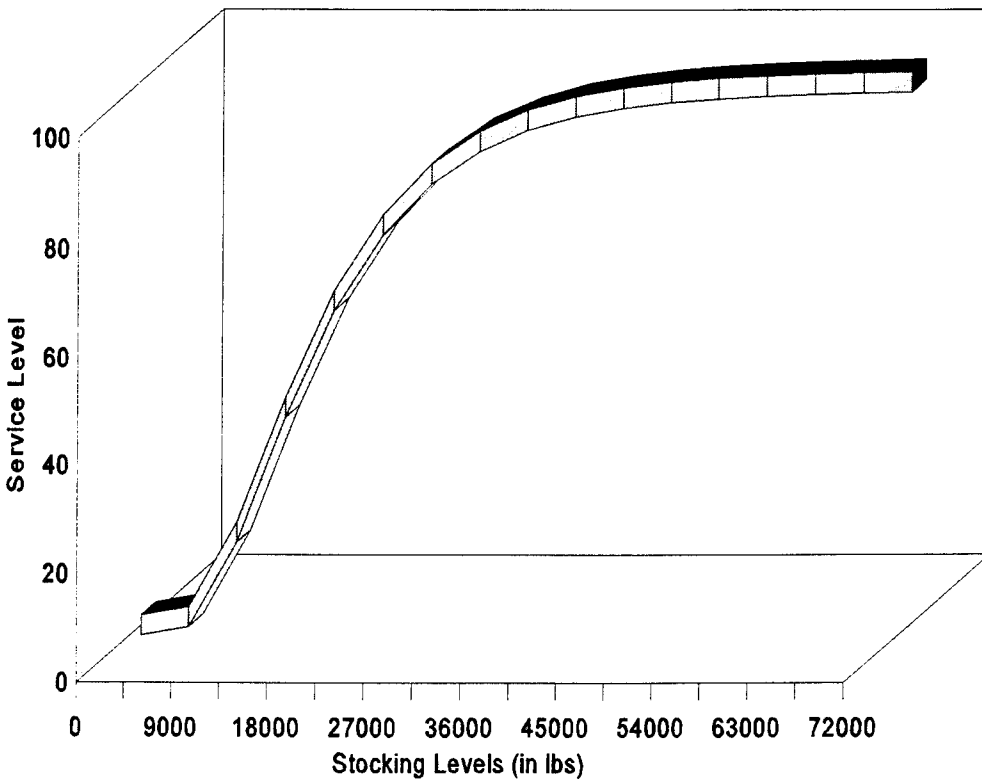


Figure 3.1. Estimated cumulative distribution function for french fries.

Using the cumulative distribution data, the derivative of the CDF is estimated by calculating the service level differences as stocking level is increased (Figure 3.2).

## Estimated Derivative of C D F For French Fries

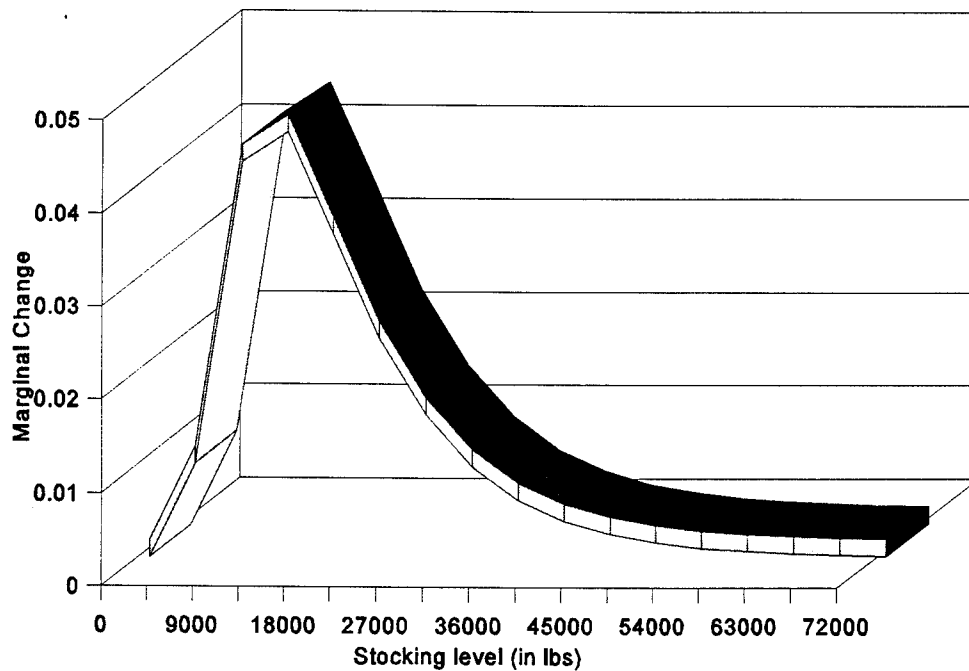


Figure 3.2. Estimated derivative of the cumulative distribution function for french fries.

The algorithm uses the estimated cumulative distribution function and the estimated derivative of that function to calculate the ratios in Equation (3.12). However the ratio used for the spreadsheet algorithm is derived from a specialized case of the Equation (3.4) objective function. In the spreadsheet algorithm objective function, the exponents  $E_A$  and  $E_B$  are equal to one, because the line items in the example are assumed to have the same relative importance and one was chosen as the exponent value for ease of

computation. These ratios are the basis for evaluating stocking levels. Figure (3.3) illustrates the ratio for french fries. The ratio decreases as stock is added showing the diminishing returns realized by adding more stock. This provides a means of prioritizing the loading of each item.

The next step is to limit the stocking levels that will be included in the evaluation. This is accomplished by evaluating the stocking levels from zero to an upper limit. The upper limit is defined by the stocking level where exclusive loading of a line item will cause the total space constraint to be exceeded.

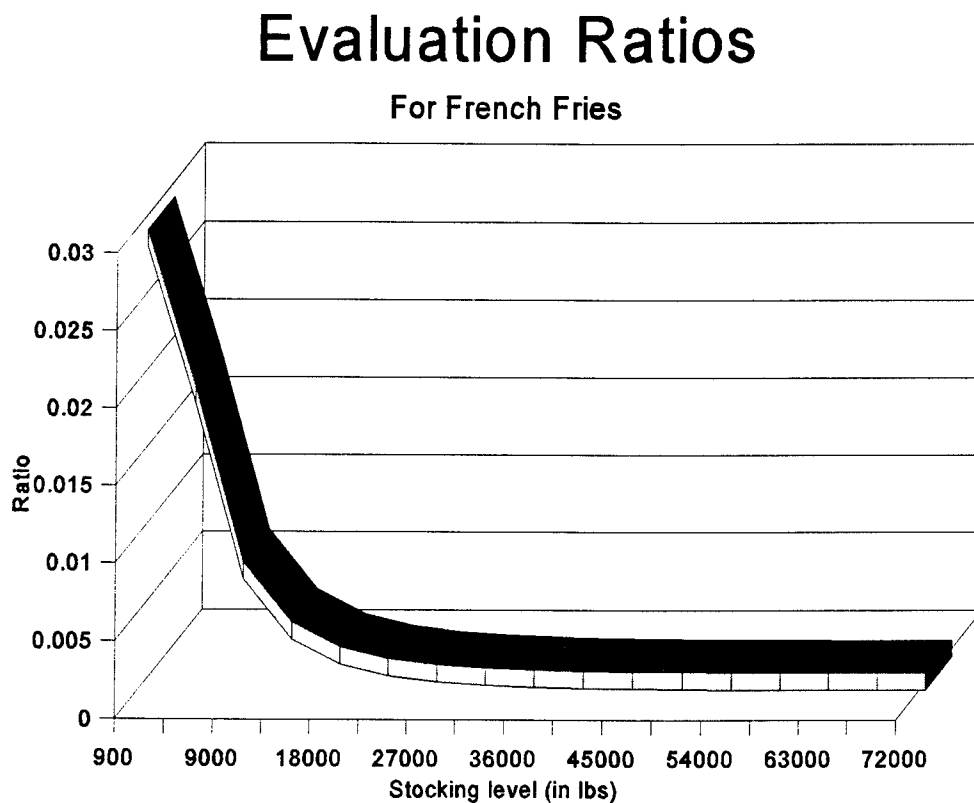


Figure 3.3 Evaluation ratios for french fries.

The next step in the algorithm is to consolidate the ratios calculated in each Type 1 spreadsheet, so a comparison can be made between line items. Once the information is consolidated, it is moved to the Type 3 spreadsheet for analysis.

The final spreadsheet numerically compares the evaluation ratios for each line item by sorting the "Evaluation Ratio" columns in descending order. This creates a prioritized list for loading. The prioritized list will be loaded in sequence until the space constraint is met. When the space constraint is reached, the sum of the units loaded is equal to the optimum load levels.



## IV. MODEL EVALUATION

### A. EVALUATION EXPLANATION

An example problem is analyzed to evaluate the algorithm. Six food products carried on Fast Combat Stores Ships (T-AFS) are evaluated. The data is taken from actual historical demand collected by the author when working for Commander Logistics Group, Western Pacific and is known to be accurate. To minimize the chance of inconsistency between issue data and demand data, high demand critical items were selected that did not experience significant stockouts. Further, the line items were chosen because they closely follow the model assumptions and typically compete for the same space. Specifically, they are items which have similar importance, are independent of each other, and are not direct substitutes for each other.

In the example, the algorithm is compared against both the Atlantic and Pacific Fleet methods of loading the CLF. However the demand data is only from the Pacific Fleet. Both fleet's methods, as described in Chapter II, use the past 12 months demand to determine a stocking level. The Pacific Fleet load is determined by tripling the item's median monthly demand to provide a "90 day load." The "90 day load" is designed to provide support to the CLF ship's customers for a three month deployment cycle. The Atlantic fleet load is determined by multiplying each line item's average monthly demand by 3.1 and is termed the "3.1 AMD load." The Atlantic Fleet load is designed to accomplish the same mission as the Pacific Fleet load, but support is provided for a different customer base. The analysis is accomplished by comparing each method with the thesis algorithm separately.

The comparison between the Pacific Fleet method and the thesis algorithm is accomplished by calculating the space required for the example load using the Pacific Fleet method and using that figure for the space constraint of the algorithm. This provides a means of comparing the two decision methods under similar conditions. The comparison

with the Atlantic Fleet is accomplished in the same manner, but the space constraint of the algorithm is determined by the load calculated using the Atlantic Fleet method.

## B. PACIFIC FLEET COMPARISON

The Pacific fleet method and the method developed in the thesis are compared in Figure (4.1). The units used to load the T-AFS are pallets of material. The cubic feet occupied by each line item is also listed.

| <b>Item</b>         | <b>Pacific Fleet<br/>Pallets</b> | <b>Pacific Fleet<br/>Cubic Feet</b> | <b>Algorithm<br/>Pallets</b> | <b>Algorithm<br/>Cubic Feet</b> |
|---------------------|----------------------------------|-------------------------------------|------------------------------|---------------------------------|
| <b>Oven Roast</b>   | 24                               | 730.8                               | 32                           | 974.4                           |
| <b>Pork Chops</b>   | 12                               | 450.0                               | 20                           | 750.0                           |
| <b>Bacon</b>        | 25                               | 962.5                               | 29                           | 1116.5                          |
| <b>Frankfurters</b> | 25                               | 847.5                               | 28                           | 949.2                           |
| <b>Ground Beef</b>  | 54                               | 1895.4                              | 49                           | 1719.9                          |
| <b>Chicken</b>      | 81                               | 2693.2                              | 62                           | 2061.5                          |
|                     | <b>Total Space</b>               | 7579.4                              | <b>Total Space</b>           | 7571.5                          |

Figure 4.1. Space occupied: Pacific Fleet method vs. proposed algorithm.

To analyze the loading decisions made in Figure (4.1), the pallet counts are evaluated using the estimated cumulative distributions for each line item that were derived in Chapter III. Since the cumulative distribution functions represent the expected service level provided for each line item, an overall service level can be determined for the six items of the example. Figure (4.2) lists the expected service level for each line item using the Pacific Fleet method and for the proposed algorithm. Higher service levels indicate a higher probability that the CLF will fulfill all of its customer's needs. The load's overall

service level is determined by multiplying all of the individual line item's services levels together. This is a measurement of the overall "reliability" of the inventory system. In the example, the thesis algorithm significantly outperforms the Pacific Fleet's method. The algorithm achieved a 70% increase in inventory "reliability," i. e., supply effectiveness.

| <b>Item</b>         | <b>Pacific Fleet<br/>Pallets</b> | <b>Pacific Fleet<br/>"Reliability"</b> | <b>Algorithm<br/>Pallets</b> | <b>Algorithm<br/>"Reliability"</b> |
|---------------------|----------------------------------|--|------------------------------|------------------------------------|
| <b>Oven Roast</b>   | 24                               | 43.4%                                  | 32                           | 74.1%                              |
| <b>Pork Chops</b>   | 12                               | 34.8%                                  | 20                           | 72.0%                              |
| <b>Bacon</b>        | 25                               | 28.6%                                  | 29                           | 35.3%                              |
| <b>Frankfurters</b> | 25                               | 59.4%                                  | 28                           | 69.3%                              |
| <b>Ground Beef</b>  | 54                               | 46.0%                                  | 49                           | 38.3%                              |
| <b>Chicken</b>      | 81                               | 58.6%                                  | 62                           | 32.9%                              |
| <b>Total</b>        | <b>"Reliability"</b>             | <b>.7%</b>                             | <b>"Reliability"</b>         | <b>1.6%</b>                        |

Figure 4.2. Reliability: Pacific Fleet method vs. proposed algorithm.

Also, this increase is slightly understated because the algorithm uses 7.95 less cubic feet of space than the Pacific Fleet method. The additional space could be filled with an item of the Supply Officer's choice to further increase inventory "reliability."

Inspection of Figure (4.2) indicates that the algorithm outperforms the Pacific Fleet method by finding the best overall mix of material to maximize customer satisfaction. It does not try to optimize each item independently. The algorithm treats the inventory items together as a system to optimize the overall inventory system performance. The algorithm indicates that better use of the CLF storage space can be achieved by loading more oven roast, pork chops, bacon, and frankfurters and less ground beef and chicken. Greater overall customer satisfaction can be achieved using the same storage space.

### C. ATLANTIC FLEET COMPARISON

The comparison between the Atlantic Fleet method and the thesis algorithm is accomplished in the same manner as is done with the Pacific's. The pallet count and the cubic feet of space occupied is listed in Figure (4.3).

| <b>Item</b>         | <b>Atlantic Fleet<br/>Pallets</b> | <b>Atlantic Fleet<br/>Cubic Feet</b> | <b>Algorithm<br/>Pallets</b> | <b>Algorithm<br/>Cubic Feet</b> |
|---------------------|-----------------------------------|--------------------------------------|------------------------------|---------------------------------|
| <b>Oven Roast</b>   | 28                                | 852.6                                | 36                           | 1096.2                          |
| <b>Pork Chops</b>   | 17                                | 637.5                                | 24                           | 900.0                           |
| <b>Bacon</b>        | 54                                | 2079.0                               | 40                           | 1540.0                          |
| <b>Frankfurters</b> | 25                                | 847.5                                | 33                           | 1118.7                          |
| <b>Ground Beef</b>  | 64                                | 2246.4                               | 61                           | 2141.1                          |
| <b>Chicken</b>      | 81                                | 2693.3                               | 77                           | 2560.3                          |
|                     | <b>Total Space</b>                | 9356.3                               | <b>Total Space</b>           | 9356.3                          |

Figure 4.3. Space occupied: Atlantic Fleet method vs. proposed algorithm.

The cumulative distributions are again used to determine the "reliability" of each line item. The overall inventory "reliability" is calculated by multiplying all the individual line item service levels together (Figure 4.4).

In this part of the example, the thesis algorithm also outperforms the Atlantic Fleet's method. The algorithm produced a 60% increase in inventory "reliability," i. e., supply effectiveness.

| <b>Item</b>         | <b>Atlantic Fleet<br/>Pallets</b> | <b>Atlantic Fleet<br/>"Reliability"</b> | <b>Algorithm<br/>Pallets</b> | <b>Algorithm<br/>"Reliability"</b> |
|---------------------|-----------------------------------|---|------------------------------|------------------------------------|
| <b>Oven Roast</b>   | 28                                | 60.6%                                   | 36                           | 83.6%                              |
| <b>Pork Chops</b>   | 17                                | 60.8%                                   | 24                           | 82.4%                              |
| <b>Bacon</b>        | 54                                | 65.7%                                   | 40                           | 51.1%                              |
| <b>Frankfurters</b> | 25                                | 59.4%                                   | 33                           | 81.3%                              |
| <b>Ground Beef</b>  | 64                                | 59.6%                                   | 61                           | 55.8%                              |
| <b>Chicken</b>      | 81                                | 58.6%                                   | 77                           | 53.7%                              |
| <b>Total</b>        | <b>"Reliability"</b>              | 5.0%                                    | <b>"Reliability"</b>         | 8.6%                               |

Figure 4.4. Reliability: Atlantic Fleet method vs. proposed algorithm.

Here again the algorithm selects a different item mix than the current method. The algorithm achieves a higher level of supply effectiveness within the same space constraint by loading more oven roast, pork chops, and frankfurters, but less bacon, ground beef, and chicken. The algorithm makes stocking decisions based on the overall system "reliability," not based on the individual "reliability" of each item. If item stocking decisions are considered separately, local optimum stocking levels may be determined that do not maximize overall customer satisfaction. By considering the inventory as a system, a global optimum level can be determined which will maximize customer satisfaction.



## V. RECOMMENDATIONS AND CONCLUSIONS

### A. RECOMMENDATIONS

#### 1. Re-define Supply Effectiveness

Re-define supply effectiveness based on units of inventory delivered to the customer vice the number of requisitions filled or partially filled by the CLF ship. The proposed equation for measuring supply effectiveness is Equation (3.3). This percentage will provide an objective and realistic performance measure to evaluate stocking decisions.

#### 2. Demand Data Collection

Regardless of the method used to determine stocking levels for CLF ships, accurate demand data is paramount to making sound inventory decisions. During the research and preparation of this thesis several inaccuracies and procedural flaws were discovered associated with the collection of demand data. The most disturbing problems are: (1) demand data is frequently collected as issue data; (2) transfers to other CLF ships are sometimes treated as demands; (3) data collection is not accomplished using standard procedures.

Issue data and demand data are equal only when stock outs, partial issues, and incorrect issues do not occur. Unfortunately, all three of these phenomenon occur on a regular basis. Stock outs and partial issues result in much lower demand being recorded than is actually occurring and incorrect issues cause errors in both directions. To make matters worse, underestimating demand can cause an inventory manager to carry less of an item and therefore increase the chances of future stock outs. This vicious cycle, if unnoticed, can cause recurring problems with inventory items experiencing this inaccurate demand reporting phenomenon. Caution must be taken when recording a customer's requisitions as demand. If the requisition is not fully filled and stock outs occur over several requisition cycles, customers may place repeat orders for the same material,

inflating demand for those products. This occurs because unfilled requisitions are canceled. They are not placed in a back order status.

Demand should only be recorded when a consumer places an order. Recording transfers between CLF ships as demand can quickly inflate recorded demand, because double counting occurs. For example, USNS SAN DIEGO (T-AFS-6) transfers material to USNS CONCORD (T-AFS-5) and records the issue as demand. CONCORD transfers the same material to USS WHIDBEY ISLAND (LSD-41) who consumes it and CONCORD records the demand a second time. Requisitions from other CLF units should be coded as either for "own ships use" or "for fleet transfer" to avoid double counting.

Data collection should be accomplished in a standard way. Each ship adopts its own method and uses different software and hardware to accomplish this task. Spreadsheets are the most prevalent means to collect demand. These spreadsheets provide a quick and easy way to keep track of past demand, but no standard procedures or program is used. This makes transfer of data between CLF ships and the operational staff difficult. Paper copies of the data are either sent through the mail, faxed or transmitted by Naval Message and then the information is key punched into the staff's spreadsheet. Standard demand collection procedures utilizing a single spreadsheet application program would improve accuracy and allow for the efficient transfer of information between ships and staff.

### **3. Implementation of the Algorithm**

Although the algorithm can accept a large number of items, the CLF Supply Officer can best use the algorithm by breaking the loading process down into small pieces. This is done for two reasons. First, when 25 or more line items are analyzed in the thesis spreadsheet, computing becomes slow and many desktop machines (486DX66 or less) will be unable to efficiently provide a solution. Second, the line items can be separated into groups to more closely match model assumptions. Specifically, grouping the items by

importance will allow the objective function exponents to be equal to one and restricting substitutes and compliments allow the use of the serial reliability concept.

The space on the ship can be subdivided into storage areas and product groups can be assigned to the designated areas. The items should be grouped by relative importance and should neither be substitutes nor compliments of each other. Sensitivity analysis can be performed to adjust the space allocations for each group to ensure the service level of mission critical material is maintained at an acceptable level.

#### **4. Further Research**

The spreadsheet algorithm presented in this thesis can be used to assist the CLF Supply Officer in making loading decisions when the assumptions of the spreadsheet example apply. The assumptions that restrict the application of the spreadsheet the most are: (1) items are of the same importance and (2) items are not directly substitutable. For example, if a loading decision is to decide the proper mix of candy bars to be carried by the T-AFS, the relative importance of each item is the same and substitutability is high. But, if the loading decision is between toilet paper, oil filters and six kinds of tabulating paper, the relative importance is critical. The consequences of running out of oil filters may be an expensive repair. Running out of toilet paper will cause serious morale problems. Running out of one kind of tabulating paper may go unnoticed due to substitutability. For the spreadsheet to be useful in this instance, it could assign different weights to each item and consider how substitution effects those weights. By revising the objective equation and evaluation ratio, the present spreadsheet algorithm can be used without major revision. However, further research could be directed to explicitly incorporate importance and substitutability effects.

## **B. CONCLUSION**

The purpose of this thesis is to provide a management tool for CLF Supply Officers to better load their ships. To do this, an algorithm based on marginal analysis is developed. The algorithm produces a prioritized list of items in their optimal loading sequence. The Supply Officer determines the amount of space that is available and then loads items, in sequence, from the prioritized list until the space is filled. This improved loading process will enable the CLF ship to better serve its customers.

The algorithm performs better than both the Pacific and Atlantic Fleet methods currently used. This improvement is significant, but does not represent the greatest strength of the model. The strength of the model can be found in its flexibility. The current models only provide one level of loading, which may or may not exceed the storage space available. For example, if the current models produce a load that will not fit on the CLF ship, what should the Supply Officer leave behind? Or, if the load is placed on the ship and more room is available, what items should be loaded in the extra space? The thesis algorithm provides the loads that can precisely match the available space with the highest possible level of customer service. Recalculation is not necessary unless a line item is added or deleted.

In summary, the algorithm is a management tool that will enhance the ability of the CLF Supply Officer to better serve the fleet customer. The algorithm is: (1) consistent, (2) objective, (3) realistic, (4) easy-to-use, and (5) updatable.

Furthermore, the thesis algorithm is not limited to use on a CLF ship. The model is generic enough to be applied to any inventory problem where a demand distribution is known and space is the limiting factor in determining stocking levels. For example, the algorithm may be used to load inventory on Maritime Prepositioning Ships which are used to support a Marine Corps Expeditionary Brigade for thirty days. Loading these ships is also a single order problem with space as the relevant constraint. The concept and

algorithm presented in this thesis works with any demand distribution and any inventory material.



## **APPENDIX A: DETAILED SPREADSHEET EXPLANATION**

The algorithm is made up of three different spreadsheet types. The first type evaluates each line items contribution to the inventory system. The algorithm contains as many of these spreadsheets as there are line items to be considered. The second and third types of spreadsheet consolidate the evaluated data and compare it so a stocking decision can be made. There are only one each of these spreadsheets in the algorithm.

Excerpts from each of these spreadsheet types are provided in this appendix following the explanations. The numbers highlighted on the spreadsheets correspond to the step numbers found in the detailed explanations.

### **Type 1 Spreadsheet Explanation**

#### **Step 1. Convert raw data from a lognormal pattern to a normal distribution.**

Since the lognormal distribution is assumed, calculate the natural logarithm of the raw demand data (row "3") using the "LN" function. This enables the data to be treated as being normally distributed.

#### **Step 2. Find the mean and standard deviation**

Calculate the mean of the converted data (row "4") as if the data fits a normal distribution using the "AVG" function (cell "B6"). Calculate the standard deviation of the converted data (row "4") using the "STDEV" function (cell "B7").

#### **Step 3. Determine the possible stocking levels for each item.**

The possible stocking level for each item are listed in the first and second columns in the spreadsheet. The first column is the number of possible pallets (a pallet consists of 30 to 42 cases) and the second column is the number of pallets converted to units of issue. Both columns start at zero and then increase in full pallet increments. Both columns

continue until the number of pallets, multiplied by the cubic feet per pallet (cell "H12") is equal to the overall storage constraint (cell "F10"). For example, a pallet of french fries contain thirty 30 lb cases of fries. The units of issue stocking level (column "B") for this example would increase in multiples of 900 lbs (30 X 30) until it reaches a storage constraint.

**Step 4. Convert possible stocking levels to their natural logarithms.**

Convert the possible stocking levels (column "B") to the same units of measurement as the mean (cell "B6") and standard deviation (cell "B7") of the demand data.

**Step 5. Estimate the cumulative distribution function (CDF) of demand.**

Calculate the estimated CDF using the "NORMDIST" function. The parameters of the normal curve are estimated by the converted mean (cell "B6") and standard deviation (cell "B7"). The "x" values are taken from the natural logarithm of the stocking levels (column "C"). After the calculations are completed the CDF (column "D") is changed to a percentage by multiplying it by 100. The CDF is considered an estimation because the increments of "x" must be infinitely small to precisely show the CDF.

**Step 6. Estimate the Probability Distribution Function(pdf).**

Estimate the pdf by calculating the difference between each incremental change of the CDF (column "D").

**Step 7. Recopy Stocking Level .**

Copy potential stocking level (column "B") to evaluated stocking level (column "F"). This will assist in the process of consolidating each line item to a single sheet.

### **Step 8. Calculate the Evaluation Ratio.**

Calculate the evaluation ratio that was derived in Chapter 3 in the section on algorithm development. The ratio is created by dividing the estimated pdf (column "E") by the CDF (column "D") multiplied by the cubic feet occupied by one pallet of material (cell "H12").

### **Type 2 Spreadsheet Explanation.**

The type 2 spreadsheet is created by copying the evaluated stocking level (column "F") and the evaluated ratio (column "G") from each type 1 spreadsheet and consolidating them. This is accomplished by copying the first line item to a new spreadsheet and then copying each successive line item to the proceedings columns end. The consolidated columns form a single large column with a significant amount of blank cells between line items. The final step in this spreadsheet is to remove those blank cells. EXCEL can easily accomplish this task by filtering out the blank cells.

### **Type 3 Spreadsheet Explanation.**

#### **Step 1. Prioritize a stocking list.**

A prioritized list is established by copying the item (column "A"), the evaluated stocking level (column "B"), and the evaluated ratio (column "C") from the type 2 spreadsheet. The three columns are copied next to a numbered column and are sorted by the evaluated ratio in descending order. This produces a list that represents the sequence of loading.

**Step 2. Count the number of pallets that are to be loaded at a particular space constraint.**

Create a column for each line item that counts the number of pallets that should be loaded according to the loading sequence. The count is accomplished by using the "DCOUNT" function.

**Step 3. Determine the space each line item occupies.**

Calculate the space each line item occupies by multiplying the space occupied for one pallet (row "3") and the count determined in step 2.

**Step 4. Determine the total space occupied.**

Calculate the total space occupied for each point of the loading sequence by adding the space occupied for each line item (columns "F", "H", "J", "L", "N", and "P")

**Step 5. Locate the point in the sequence when the space constraint is reached.**

Find the recommended load by locating the point where the space constraint is reached. This is accomplished by putting a decision function in the total space occupied column (column "Q"). The total space column stops when the space constraint is reached.

**Step 6. Find the recommended stocking levels.**

The row just prior to surpassing the space constraint contains the recommended stocking level (row "82"). The load numbers are found in the item columns ("E", "G", "I", "K", "M", and "O").

TYPE 1 SPREADSHEET

|    | A                      | B         | C      | D            | E            | F        | G          | H     |
|----|------------------------|-----------|--------|--------------|--------------|----------|------------|-------|
| 1  | ITEM                   | JAN       | FEB    | MAR          | MAY          | JUN      | JUL        | SEP   |
| 2  |                        | SAT       | SAT    | SAT          | SJO          | SJO      | SJO        | NFL   |
| 3  | French                 | 30030     | 28820  | 36705        | 15960        | 18574    | 17280      | 11400 |
| 4  | Fries                  | 10.31     | 10.27  | 10.51        | 9.68         | 9.83     | 9.76       | 9.34  |
| 5  |                        |           |        |              |              |          |            |       |
| 6  | Mean &                 | 9.65      |        |              |              |          |            |       |
| 7  | Std Dev                | 0.58      |        |              |              |          |            |       |
| 8  | of Ln                  |           |        |              |              |          |            |       |
| 9  |                        |           |        |              |              |          |            |       |
| 10 | Total Space Constraint |           |        |              |              |          | 2,820 sqft |       |
| 11 |                        |           |        |              |              |          |            |       |
| 12 | Case Cube              | 1.17      |        |              | Cases per    | Pallet   |            | 35.10 |
| 13 | Case pack              | 30        |        |              | Pallet       | 30       |            | Cube  |
| 14 | Max # of pallets       | 80        |        |              |              |          |            |       |
| 15 |                        |           |        |              |              |          |            |       |
| 16 | Number                 | Potential | Ln of  | Est Cum      | Est Prob     | Eval     | Eval       |       |
| 17 | of pallet              | Stocking  | Stock  | Distribution | Distribution | Stocking | Ratio      |       |
| 18 | levels                 | levels    | Levels | Function     | Function     | Level    |            |       |
| 19 |                        |           |        |              |              |          |            |       |
| 20 | 1                      | 900       | 6.802  | 0.00%        | 0.000000     | 900      | 0.028490   |       |
| 21 | 2                      | 1800      | 7.496  | 0.01%        | 0.000089     | 1800     | 0.028373   |       |
| 22 | 3                      | 2700      | 7.901  | 0.12%        | 0.001079     | 2700     | 0.026321   |       |
| 23 | 4                      | 3600      | 8.189  | 0.55%        | 0.004313     | 3600     | 0.022421   |       |
| 24 | 5                      | 4500      | 8.412  | 1.55%        | 0.010058     | 4500     | 0.018441   |       |
| 25 | 6                      | 5400      | 8.594  | 3.29%        | 0.017406     | 5400     | 0.015052   |       |
| 26 | 7                      | 6300      | 8.748  | 5.81%        | 0.025119     | 6300     | 0.012325   |       |
| 27 | 8                      | 7200      | 8.882  | 9.03%        | 0.032199     | 7200     | 0.010163   |       |
| 28 | 9                      | 8100      | 9.000  | 12.83%       | 0.038047     | 8100     | 0.008448   |       |
| 29 | 10                     | 9000      | 9.105  | 17.07%       | 0.042420     | 9000     | 0.007079   |       |
| 30 | 11                     | 9900      | 9.200  | 21.60%       | 0.045314     | 9900     | 0.005976   |       |
| 31 | 12                     | 10800     | 9.287  | 26.29%       | 0.046870     | 10800    | 0.005079   |       |
| 32 | 13                     | 11700     | 9.367  | 31.02%       | 0.047293     | 11700    | 0.004344   |       |
| 33 | 14                     | 12600     | 9.441  | 35.70%       | 0.046806     | 12600    | 0.003735   |       |
| 34 | 15                     | 13500     | 9.510  | 40.26%       | 0.045621     | 13500    | 0.003228   |       |
| 35 | 16                     | 14400     | 9.575  | 44.66%       | 0.043925     | 14400    | 0.002802   |       |
| 36 | 17                     | 15300     | 9.636  | 48.84%       | 0.041879     | 15300    | 0.002443   |       |
| 37 | 18                     | 16200     | 9.693  | 52.80%       | 0.039610     | 16200    | 0.002137   |       |
| 38 | 19                     | 17100     | 9.747  | 56.53%       | 0.037220     | 17100    | 0.001876   |       |
| 39 | 20                     | 18000     | 9.798  | 60.01%       | 0.034789     | 18000    | 0.001652   |       |
| 40 | 21                     | 18900     | 9.847  | 63.24%       | 0.032374     | 18900    | 0.001458   |       |
| 41 | 22                     | 19800     | 9.893  | 66.24%       | 0.030018     | 19800    | 0.001291   |       |
| 42 | 23                     | 20700     | 9.938  | 69.02%       | 0.027752     | 20700    | 0.001146   |       |
| 43 | 24                     | 21600     | 9.980  | 71.58%       | 0.025594     | 21600    | 0.001019   |       |
| 44 | 25                     | 22500     | 10.021 | 73.94%       | 0.023557     | 22500    | 0.000908   |       |
| 45 | 26                     | 23400     | 10.060 | 76.10%       | 0.021647     | 23400    | 0.000810   |       |
| 46 | 27                     | 24300     | 10.098 | 78.09%       | 0.019866     | 24300    | 0.000725   |       |
| 47 | 28                     | 25200     | 10.135 | 79.91%       | 0.018212     | 25200    | 0.000649   |       |

TYPE 2 SPREADSHEET

| Evaluation Item | Evaluation Level | Evaluation Ratio |  |  |  |  |
|-----------------|------------------|------------------|--|--|--|--|
| Pork chops      | 1500             | 0.026667         |  |  |  |  |
| Pork chops      | 3000             | 0.026612         |  |  |  |  |
| Pork chops      | 4500             | 0.025116         |  |  |  |  |
| Pork chops      | 6000             | 0.021699         |  |  |  |  |
| Pork chops      | 7500             | 0.017918         |  |  |  |  |
| Pork chops      | 9000             | 0.014575         |  |  |  |  |
| Pork chops      | 10500            | 0.011837         |  |  |  |  |
| Pork chops      | 12000            | 0.009651         |  |  |  |  |
| Pork chops      | 13500            | 0.007915         |  |  |  |  |
| Pork chops      | 15000            | 0.006533         |  |  |  |  |
| Pork chops      | 16500            | 0.005426         |  |  |  |  |
| Pork chops      | 18000            | 0.004533         |  |  |  |  |
| Pork chops      | 19500            | 0.003806         |  |  |  |  |
| Pork chops      | 21000            | 0.003212         |  |  |  |  |
| Pork chops      | 22500            | 0.002722         |  |  |  |  |
| Pork chops      | 24000            | 0.002316         |  |  |  |  |
| Pork chops      | 25500            | 0.001977         |  |  |  |  |
| Pork chops      | 27000            | 0.001694         |  |  |  |  |
| Pork chops      | 28500            | 0.001455         |  |  |  |  |
| Pork chops      | 30000            | 0.001253         |  |  |  |  |
| Pork chops      | 31500            | 0.001082         |  |  |  |  |
| Pork chops      | 33000            | 0.000936         |  |  |  |  |
| Pork chops      | 34500            | 0.000812         |  |  |  |  |
| Pork chops      | 36000            | 0.000705         |  |  |  |  |
| Pork chops      | 37500            | 0.000614         |  |  |  |  |
| Pork chops      | 39000            | 0.000535         |  |  |  |  |
| Pork chops      | 40500            | 0.000467         |  |  |  |  |
| Pork chops      | 42000            | 0.000409         |  |  |  |  |
| Pork chops      | 43500            | 0.000358         |  |  |  |  |
| Pork chops      | 45000            | 0.000314         |  |  |  |  |
| Pork chops      | 46500            | 0.000276         |  |  |  |  |
| Pork chops      | 48000            | 0.000242         |  |  |  |  |
| Pork chops      | 49500            | 0.000213         |  |  |  |  |
| Pork chops      | 51000            | 0.000188         |  |  |  |  |
| Pork chops      | 52500            | 0.000166         |  |  |  |  |
| Pork chops      | 54000            | 0.000147         |  |  |  |  |
| Pork chops      | 55500            | 0.000130         |  |  |  |  |
| Pork chops      | 57000            | 0.000115         |  |  |  |  |
| Pork chops      | 58500            | 0.000102         |  |  |  |  |
| Pork chops      | 60000            | 0.000090         |  |  |  |  |
| Pork chops      | 61500            | 0.000080         |  |  |  |  |
| Pork chops      | 63000            | 0.000071         |  |  |  |  |
| Pork chops      | 64500            | 0.000063         |  |  |  |  |
| Pork chops      | 66000            | 0.000056         |  |  |  |  |
| Pork chops      | 67500            | 0.000050         |  |  |  |  |
| Pork chops      | 69000            | 0.000045         |  |  |  |  |

This spreadsheet consists of 26 pages. The rest of the line items follow pork chops in these same columns.

TYPE 3 SPREADSHEET

| Pri | Item         | Eval Slt Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|
| 1   | Oven Roast   | 3500           | 0.03284    | 1          | 30.45        |           |              |       |              |             |              |             |              |         |              | 30.45       |
| 2   | Oven Roast   | 5250           | 0.03283    | 2          | 60.90        |           |              |       |              |             |              |             |              |         |              | 60.90       |
| 3   | Oven Roast   | 7000           | 0.03255    | 3          | 91.35        |           |              |       |              |             |              |             |              |         |              | 91.35       |
| 4   | Oven Roast   | 8750           | 0.03153    | 4          | 121.80       |           |              |       |              |             |              |             |              |         |              | 121.80      |
| 5   | Chicken      | 4200           | 0.03008    | 4          | 121.80       |           |              |       |              |             |              |             |              | 1       | 33.25        | 155.05      |
| 6   | Chicken      | 5600           | 0.02994    | 4          | 121.80       |           |              |       |              |             |              |             |              | 2       | 66.50        | 188.30      |
| 7   | Oven Roast   | 10500          | 0.02950    | 5          | 152.25       |           |              |       |              |             |              |             |              | 2       | 66.50        | 218.75      |
| 8   | Frankfurters | 1200           | 0.02950    | 5          | 152.25       |           |              |       |              | 1           | 33.90        |             |              | 2       | 66.50        | 252.65      |
| 9   | Frankfurters | 2400           | 0.02950    | 5          | 152.25       |           |              |       |              | 2           | 67.80        |             |              | 2       | 66.50        | 286.55      |
| 10  | Chicken      | 7000           | 0.02946    | 5          | 152.25       |           |              |       |              | 2           | 67.80        |             |              | 3       | 99.75        | 319.80      |
| 11  | Frankfurters | 3600           | 0.02932    | 5          | 152.25       |           |              |       |              | 3           | 101.70       |             |              | 3       | 99.75        | 353.70      |
| 12  | Chicken      | 8400           | 0.02851    | 5          | 152.25       |           |              |       |              | 3           | 101.70       |             |              | 4       | 133.00       | 386.95      |
| 13  | Ground Beef  | 1650           | 0.02849    | 5          | 152.25       |           |              |       |              | 3           | 101.70       | 1           | 35.10        | 4       | 133.00       | 422.05      |
| 14  | Ground Beef  | 3300           | 0.02849    | 5          | 152.25       |           |              |       |              | 3           | 101.70       | 2           | 70.20        | 4       | 133.00       | 457.15      |
| 15  | Ground Beef  | 4950           | 0.02836    | 5          | 152.25       |           |              |       |              | 3           | 101.70       | 3           | 105.30       | 4       | 133.00       | 482.25      |
| 16  | Frankfurters | 4800           | 0.02815    | 5          | 152.25       |           |              |       |              | 4           | 135.60       | 3           | 105.30       | 4       | 133.00       | 526.15      |
| 17  | Ground Beef  | 6600           | 0.02754    | 5          | 152.25       |           |              |       |              | 4           | 135.60       | 4           | 140.40       | 4       | 133.00       | 561.25      |
| 18  | Oven Roast   | 12250          | 0.02733    | 6          | 182.70       |           |              |       |              | 4           | 135.60       | 4           | 140.40       | 4       | 133.00       | 591.70      |
| 19  | Chicken      | 9800           | 0.02719    | 6          | 182.70       |           |              |       |              | 4           | 135.60       | 4           | 140.40       | 5       | 166.25       | 624.95      |
| 20  | Pork chops   | 1500           | 0.02667    | 6          | 182.70       | 1         | 37.50        |       |              | 4           | 135.60       | 4           | 140.40       | 5       | 166.25       | 662.45      |
| 21  | Pork chops   | 3000           | 0.02661    | 6          | 182.70       | 2         | 75.00        |       |              | 4           | 135.60       | 4           | 140.40       | 5       | 166.25       | 699.95      |
| 22  | Bacon        | 1575           | 0.02597    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 4           | 135.60       | 4           | 140.40       | 5       | 166.25       | 738.45      |
| 23  | Ground Beef  | 8250           | 0.02594    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 4           | 135.60       | 5           | 175.50       | 5       | 166.25       | 773.55      |
| 24  | Frankfurters | 6000           | 0.02588    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 5           | 169.50       | 5           | 175.50       | 5       | 166.25       | 807.45      |
| 25  | Chicken      | 11200          | 0.02565    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 840.70      |
| 26  | Bacon        | 3150           | 0.02542    | 6          | 182.70       | 2         | 75.00        | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 879.20      |
| 27  | Pork chops   | 4500           | 0.02512    | 6          | 182.70       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 916.70      |
| 28  | Oven Roast   | 14000          | 0.02475    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 947.15      |
| 29  | Chicken      | 12600          | 0.02402    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 7       | 232.75       | 980.40      |
| 30  | Ground Beef  | 9900           | 0.02389    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 6           | 210.60       | 7       | 232.75       | 1015.50     |
| 31  | Frankfurters | 7200           | 0.02307    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 6           | 203.40       | 6           | 210.60       | 7       | 232.75       | 1049.40     |
| 32  | Chicken      | 14000          | 0.02239    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 6           | 203.40       | 6           | 210.60       | 8       | 266.00       | 1082.65     |
| 33  | Oven Roast   | 15750          | 0.02218    | 8          | 243.60       | 3         | 112.50       | 2     | 77.00        | 6           | 203.40       | 6           | 210.60       | 8       | 266.00       | 1113.10     |

TYPE 3 SPREADSHEET

| Pri | Item         | Eval Stk Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|
| 255 | Bacon        | 56700          | 0.00080    | 35         | 1065.75      | 23        | 862.50       | 36    | 1386.00      | 32          | 1084.80      | 57          | 2000.70      | 72      | 2394.00      | 8793.75     |
| 256 | Chicken      | 105000         | 0.00078    | 35         | 1065.75      | 23        | 862.50       | 36    | 1386.00      | 32          | 1084.80      | 57          | 2000.70      | 73      | 2427.25      | 8827.00     |
| 257 | Ground Beef  | 95700          | 0.00077    | 35         | 1065.75      | 23        | 862.50       | 36    | 1386.00      | 32          | 1084.80      | 58          | 2035.80      | 73      | 2427.25      | 8862.10     |
| 258 | Bacon        | 58275          | 0.00076    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 32          | 1084.80      | 58          | 2035.80      | 73      | 2427.25      | 8900.60     |
| 259 | Chicken      | 106400         | 0.00075    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 32          | 1084.80      | 58          | 2035.80      | 74      | 2460.50      | 8933.85     |
| 260 | Ground Beef  | 97350          | 0.00074    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 32          | 1084.80      | 59          | 2070.90      | 74      | 2460.50      | 8968.95     |
| 261 | Frankfurters | 39600          | 0.00072    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 33          | 1118.70      | 59          | 2070.90      | 74      | 2460.50      | 9002.85     |
| 262 | Chicken      | 107800         | 0.00072    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 33          | 1118.70      | 59          | 2070.90      | 75      | 2493.75      | 9036.10     |
| 263 | Bacon        | 59850          | 0.00072    | 35         | 1065.75      | 23        | 862.50       | 38    | 1463.00      | 33          | 1118.70      | 59          | 2070.90      | 75      | 2493.75      | 9074.60     |
| 264 | Oven Roast   | 64750          | 0.00071    | 36         | 1096.20      | 23        | 862.50       | 38    | 1463.00      | 33          | 1118.70      | 59          | 2070.90      | 75      | 2493.75      | 9105.05     |
| 265 | Ground Beef  | 99000          | 0.00071    | 36         | 1096.20      | 23        | 862.50       | 38    | 1463.00      | 33          | 1118.70      | 60          | 2106.00      | 75      | 2493.75      | 9140.15     |
| 266 | Pork chops   | 36000          | 0.00071    | 36         | 1096.20      | 24        | 900.00       | 38    | 1463.00      | 33          | 1118.70      | 60          | 2106.00      | 75      | 2493.75      | 9177.65     |
| 267 | Chicken      | 109200         | 0.00069    | 36         | 1096.20      | 24        | 900.00       | 38    | 1463.00      | 33          | 1118.70      | 60          | 2106.00      | 76      | 2527.00      | 9210.90     |
| 268 | Bacon        | 61425          | 0.00068    | 36         | 1096.20      | 24        | 900.00       | 39    | 1501.50      | 33          | 1118.70      | 60          | 2106.00      | 76      | 2527.00      | 9249.40     |
| 269 | Ground Beef  | 100650         | 0.00068    | 36         | 1096.20      | 24        | 900.00       | 39    | 1501.50      | 33          | 1118.70      | 61          | 2141.10      | 76      | 2527.00      | 9284.50     |
| 270 | Chicken      | 110600         | 0.00066    | 36         | 1096.20      | 24        | 900.00       | 39    | 1501.50      | 33          | 1118.70      | 61          | 2141.10      | 77      | 2560.25      | 9317.75     |
| 271 | Bacon        | 63000          | 0.00065    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 33          | 1118.70      | 61          | 2141.10      | 77      | 2560.25      | 9356.25     |
| 272 | Ground Beef  | 102300         | 0.00065    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 33          | 1118.70      | 62          | 2176.20      | 77      | 2560.25      |             |
| 273 | Frankfurters | 40800          | 0.00065    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 62          | 2176.20      | 77      | 2560.25      |             |
| 274 | Chicken      | 112000         | 0.00064    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 62          | 2176.20      | 78      | 2593.50      |             |
| 275 | Oven Roast   | 66500          | 0.00062    | 37         | 1126.65      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 62          | 2176.20      | 78      | 2593.50      |             |
| 276 | Ground Beef  | 103950         | 0.00062    | 37         | 1126.65      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 63          | 2211.30      | 78      | 2593.50      |             |
| 277 | Bacon        | 64575          | 0.00062    | 37         | 1126.65      | 24        | 900.00       | 41    | 1578.50      | 34          | 1152.60      | 63          | 2211.30      | 78      | 2593.50      |             |
| 278 | Chicken      | 113400         | 0.00061    | 37         | 1126.65      | 24        | 900.00       | 41    | 1578.50      | 34          | 1152.60      | 63          | 2211.30      | 79      | 2626.75      |             |
| 279 | Pork chops   | 37500          | 0.00061    | 37         | 1126.65      | 25        | 937.50       | 41    | 1578.50      | 34          | 1152.60      | 63          | 2211.30      | 79      | 2626.75      |             |
| 280 | Ground Beef  | 105600         | 0.00059    | 37         | 1126.65      | 25        | 937.50       | 41    | 1578.50      | 34          | 1152.60      | 64          | 2246.40      | 79      | 2626.75      |             |
| 281 | Chicken      | 114800         | 0.00059    | 37         | 1126.65      | 25        | 937.50       | 41    | 1578.50      | 34          | 1152.60      | 64          | 2246.40      | 80      | 2660.00      |             |
| 282 | Bacon        | 66150          | 0.00059    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 34          | 1152.60      | 64          | 2246.40      | 80      | 2660.00      |             |
| 283 | Frankfurters | 42000          | 0.00058    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 35          | 1186.50      | 64          | 2246.40      | 80      | 2660.00      |             |
| 284 | Chicken      | 116200         | 0.00057    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 35          | 1186.50      | 64          | 2246.40      | 81      | 2693.25      |             |
| 285 | Ground Beef  | 107250         | 0.00057    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 35          | 1186.50      | 65          | 2281.50      | 81      | 2693.25      |             |
| 286 | Bacon        | 67725          | 0.00056    | 37         | 1126.65      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 65          | 2281.50      | 81      | 2693.25      |             |
| 287 | Oven Roast   | 68250          | 0.00055    | 38         | 1157.10      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 65          | 2281.50      | 81      | 2693.25      |             |
| 288 | Chicken      | 117600         | 0.00055    | 38         | 1157.10      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 65          | 2281.50      | 82      | 2726.50      |             |
| 289 | Ground Beef  | 108900         | 0.00054    | 38         | 1157.10      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 66          | 2316.60      | 82      | 2726.50      |             |
| 290 | Pork chops   | 39000          | 0.00054    | 38         | 1157.10      | 26        | 975.00       | 43    | 1655.50      | 35          | 1186.50      | 66          | 2316.60      | 82      | 2726.50      |             |

## **APPENDIX B. CHAPTER IV SIX ITEM EXAMPLE**

This appendix consists of excerpts from nine spreadsheets that analyze the six item example summarized in Chapter IV. Explanations of the spreadsheets are found in Appendix A. The appendix includes only the pages of the spreadsheets that are relevant to the stocking decision.

The first six spreadsheets are "Type 1" spreadsheets for each of the six line items. The seventh is a "Type 2" spreadsheet that consolidates the six "Type 1" spreadsheets. The eighth is a "Type 3" spreadsheet that provides an sequential stocking list for this example. The ninth spreadsheet is a summary of the stocking decision determined by the current Pacific and Atlantic Fleet methods.

On the "type 3" spreadsheet, two rows are highlighted to show stocking decisions. The first is the comparison with the Pacific Fleet method and the second is a comparison with the Atlantic Fleet method.

| Over Road          |                           |                    |                              |                               |                           |                  |            |
|--------------------|---------------------------|--------------------|------------------------------|-------------------------------|---------------------------|------------------|------------|
| # of pallet levels | Potential Stocking levels | Ln of Stock Levels | Est Cum Distributio Function | Est Prob Distributio Function | Evaluation Stocking Level | Evaluation Ratio |            |
| 1                  | 1750                      | 7.4674             |                              |                               | 1750                      |                  |            |
| 2                  | 3500                      | 8.1605             | 0.00%                        | 0.0000000                     | 3500                      | 0.0328407        |            |
| 3                  | 5250                      | 8.5660             | 0.00%                        | 0.0000000                     | 5250                      | 0.0328265        |            |
| 4                  | 7000                      | 8.8537             | 0.00%                        | 0.0000001                     | 7000                      | 0.0325472        |            |
| 5                  | 8750                      | 9.0768             | 0.00%                        | 0.0000020                     | 8750                      | 0.0315260        |            |
| 6                  | 10500                     | 9.2591             | 0.00%                        | 0.0000200                     | 10500                     | 0.0296943        |            |
| 7                  | 12250                     | 9.4133             | 0.01%                        | 0.0001095                     | 12250                     | 0.0273321        |            |
| 8                  | 14000                     | 9.5468             | 0.05%                        | 0.0004028                     | 14000                     | 0.0247539        |            |
| 9                  | 15750                     | 9.6646             | 0.16%                        | 0.0011122                     | 15750                     | 0.0221831        |            |
| 10                 | 17500                     | 9.7700             | 0.41%                        | 0.0024836                     | 17500                     | 0.0197485        |            |
| 11                 | 19250                     | 9.8653             | 0.88%                        | 0.0047181                     | 19250                     | 0.0175115        |            |
| 12                 | 21000                     | 9.9523             | 1.68%                        | 0.0079024                     | 21000                     | 0.0154932        |            |
| 13                 | 22750                     | 10.0323            | 2.87%                        | 0.0119771                     | 22750                     | 0.0136918        |            |
| 14                 | 24500                     | 10.1064            | 4.55%                        | 0.0167473                     | 24500                     | 0.0120944        |            |
| 15                 | 26250                     | 10.1754            | 6.74%                        | 0.0219249                     | 26250                     | 0.0106829        |            |
| 16                 | 28000                     | 10.2400            | 9.46%                        | 0.0271815                     | 28000                     | 0.0094380        |            |
| 17                 | 29750                     | 10.3006            | 12.68%                       | 0.0321995                     | 29750                     | 0.0083408        |            |
| 18                 | 31500                     | 10.3577            | 16.35%                       | 0.0367087                     | 31500                     | 0.0073738        |            |
| 19                 | 33250                     | 10.4118            | 20.40%                       | 0.0405077                     | 33250                     | 0.0065212        |            |
| 20                 | 35000                     | 10.4631            | 24.75%                       | 0.0434711                     | 35000                     | 0.0057689        |            |
| 21                 | 36750                     | 10.5119            | 29.30%                       | 0.0455454                     | 36750                     | 0.0051047        |            |
| 22                 | 38500                     | 10.5584            | 33.98%                       | 0.0467382                     | 38500                     | 0.0045178        |            |
| 23                 | 40250                     | 10.6029            | 38.69%                       | 0.0471037                     | 40250                     | 0.0039987        |            |
| 24                 | 42000                     | 10.6454            | <b>43.36%</b>                | 0.0467292                     | 42000                     | 0.0035394        | Pacific    |
| 25                 | 43750                     | 10.6862            | 47.93%                       | 0.0457210                     | 43750                     | 0.0031327        |            |
| 26                 | 45500                     | 10.7255            | 52.35%                       | 0.0441936                     | 45500                     | 0.0027724        |            |
| 27                 | 47250                     | 10.7632            | 56.58%                       | 0.0422603                     | 47250                     | 0.0024531        |            |
| 28                 | 49000                     | 10.7996            | <b>60.58%</b>                | 0.0400292                     | 49000                     | 0.0021700        | Atlantic   |
| 29                 | 50750                     | 10.8347            | 64.34%                       | 0.0375973                     | 50750                     | 0.0019191        |            |
| 30                 | 52500                     | 10.8686            | 67.84%                       | 0.0350490                     | 52500                     | 0.0016966        |            |
| 31                 | 54250                     | 10.9014            | 71.09%                       | 0.0324555                     | 54250                     | 0.0014993        |            |
| 32                 | 56000                     | 10.9331            | <b>74.08%</b>                | 0.0298749                     | 56000                     | 0.0013245        | Algorithm- |
| 33                 | 57750                     | 10.9639            | 76.81%                       | 0.0273531                     | 57750                     | 0.0011695        | Pacific    |
| 34                 | 59500                     | 10.9937            | 79.30%                       | 0.0249248                     | 59500                     | 0.0010322        |            |
| 35                 | 61250                     | 11.0227            | 81.57%                       | 0.0226150                     | 61250                     | 0.0009105        |            |
| 36                 | 63000                     | 11.0509            | <b>83.61%</b>                | 0.0204406                     | 63000                     | 0.0008029        | Algorithm- |
| 37                 | 64750                     | 11.0783            | 85.45%                       | 0.0184117                     | 64750                     | 0.0007076        | Atlantic   |
| 38                 | 66500                     | 11.1050            | 87.10%                       | 0.0165331                     | 66500                     | 0.0006233        |            |
| 39                 | 68250                     | 11.1309            | 88.58%                       | 0.0148050                     | 68250                     | 0.0005489        |            |
| 40                 | 70000                     | 11.1563            | 89.91%                       | 0.0132245                     | 70000                     | 0.0004831        |            |
| 41                 | 71750                     | 11.1809            | 91.09%                       | 0.0117864                     | 71750                     | 0.0004250        |            |
| 42                 | 73500                     | 11.2050            | 92.13%                       | 0.0104836                     | 73500                     | 0.0003737        |            |
| 43                 | 75250                     | 11.2286            | 93.07%                       | 0.0093081                     | 75250                     | 0.0003285        |            |

| <b>Pork Chops</b>          |                                  |                           |                                     |                                      |                                  |                         |
|----------------------------|----------------------------------|---------------------------|-------------------------------------|--------------------------------------|----------------------------------|-------------------------|
| <b># of pallets levels</b> | <b>Potential Stocking levels</b> | <b>Ln of Stock Levels</b> | <b>Est Cum Distributio Function</b> | <b>Est Prob Distributio Function</b> | <b>Evaluation Stocking Level</b> | <b>Evaluation Ratio</b> |
| 1                          | 1500                             | 7.3132                    | 0.00%                               | 0.0000001                            | 1500                             | 0.0266667               |
| 2                          | 3000                             | 8.0064                    | 0.01%                               | 0.0000697                            | 3000                             | 0.0266115               |
| 3                          | 4500                             | 8.4118                    | 0.12%                               | 0.0011307                            | 4500                             | 0.0251162               |
| 4                          | 6000                             | 8.6995                    | 0.64%                               | 0.0052438                            | 6000                             | 0.0216990               |
| 5                          | 7500                             | 8.9227                    | 1.96%                               | 0.0131976                            | 7500                             | 0.0179176               |
| 6                          | 9000                             | 9.1050                    | 4.33%                               | 0.0236745                            | 9000                             | 0.0145746               |
| 7                          | 10500                            | 9.2591                    | 7.79%                               | 0.0345749                            | 10500                            | 0.0118370               |
| 8                          | 12000                            | 9.3927                    | 12.21%                              | 0.0441796                            | 12000                            | 0.0096511               |
| 9                          | 13500                            | 9.5104                    | 17.36%                              | 0.0515294                            | 13500                            | 0.0079154               |
| 10                         | 15000                            | 9.6158                    | 22.99%                              | 0.0563336                            | 15000                            | 0.0065333               |
| 11                         | 16500                            | 9.7111                    | 28.87%                              | 0.0587389                            | 16500                            | 0.0054261               |
| 12                         | 18000                            | 9.7981                    | <b>34.78%</b>                       | 0.0591160                            | 18000                            | 0.0045327               |
| 13                         | 19500                            | 9.8782                    | 40.57%                              | 0.0579110                            | 19500                            | 0.0038065               |
| 14                         | 21000                            | 9.9523                    | 46.13%                              | 0.0555583                            | 21000                            | 0.0032120               |
| 15                         | 22500                            | 10.0213                   | 51.37%                              | 0.0524370                            | 22500                            | 0.0027221               |
| 16                         | 24000                            | 10.0858                   | 56.26%                              | 0.0488552                            | 24000                            | 0.0023159               |
| 17                         | 25500                            | 10.1464                   | <b>60.76%</b>                       | 0.0450522                            | 25500                            | 0.0019773               |
| 18                         | 27000                            | 10.2036                   | 64.88%                              | 0.0412046                            | 27000                            | 0.0016936               |
| 19                         | 28500                            | 10.2577                   | 68.62%                              | 0.0374370                            | 28500                            | 0.0014548               |
| 20                         | 30000                            | 10.3090                   | <b>72.01%</b>                       | 0.0338331                            | 30000                            | 0.0012529               |
| 21                         | 31500                            | 10.3577                   | 75.05%                              | 0.0304454                            | 31500                            | 0.0010817               |
| 22                         | 33000                            | 10.4043                   | 77.78%                              | 0.0273027                            | 33000                            | 0.0009360               |
| 23                         | 34500                            | 10.4487                   | 80.22%                              | 0.0244171                            | 34500                            | 0.0008116               |
| 24                         | 36000                            | 10.4913                   | <b>82.40%</b>                       | 0.0217889                            | 36000                            | 0.0007051               |
| 25                         | 37500                            | 10.5321                   | 84.34%                              | 0.0194102                            | 37500                            | 0.0006137               |
| 26                         | 39000                            | 10.5713                   | 86.07%                              | 0.0172684                            | 39000                            | 0.0005350               |
| 27                         | 40500                            | 10.6091                   | 87.61%                              | 0.0153476                            | 40500                            | 0.0004672               |
| 28                         | 42000                            | 10.6454                   | 88.97%                              | 0.0136305                            | 42000                            | 0.0004085               |
| 29                         | 43500                            | 10.6805                   | 90.18%                              | 0.0120997                            | 43500                            | 0.0003578               |
| 30                         | 45000                            | 10.7144                   | 91.25%                              | 0.0107375                            | 45000                            | 0.0003138               |
| 31                         | 46500                            | 10.7472                   | 92.21%                              | 0.0095275                            | 46500                            | 0.0002755               |
| 32                         | 48000                            | 10.7790                   | 93.05%                              | 0.0084538                            | 48000                            | 0.0002423               |
| 33                         | 49500                            | 10.8097                   | 93.80%                              | 0.0075021                            | 49500                            | 0.0002133               |
| 34                         | 51000                            | 10.8396                   | 94.47%                              | 0.0066590                            | 51000                            | 0.0001880               |
| 35                         | 52500                            | 10.8686                   | 95.06%                              | 0.0059125                            | 52500                            | 0.0001659               |
| 36                         | 54000                            | 10.8967                   | 95.58%                              | 0.0052517                            | 54000                            | 0.0001465               |
| 37                         | 55500                            | 10.9241                   | 96.05%                              | 0.0046668                            | 55500                            | 0.0001296               |
| 38                         | 57000                            | 10.9508                   | 96.46%                              | 0.0041491                            | 57000                            | 0.0001147               |
| 39                         | 58500                            | 10.9768                   | 96.83%                              | 0.0036908                            | 58500                            | 0.0001016               |
| 40                         | 60000                            | 11.0021                   | 97.16%                              | 0.0032851                            | 60000                            | 0.0000902               |
| 41                         | 61500                            | 11.0268                   | 97.45%                              | 0.0029257                            | 61500                            | 0.0000801               |
| 42                         | 63000                            | 11.0509                   | 97.72%                              | 0.0026073                            | 63000                            | 0.0000712               |
| 43                         | 64500                            | 11.0744                   | 97.95%                              | 0.0023250                            | 64500                            | 0.0000633               |

| <b>Baton</b>               |                                  |                           |                                     |                                      |                                  |                         |                   |
|----------------------------|----------------------------------|---------------------------|-------------------------------------|--------------------------------------|----------------------------------|-------------------------|-------------------|
| <b># of pallets levels</b> | <b>Potential Stocking levels</b> | <b>Ln of Stock Levels</b> | <b>Est Cum Distributio Function</b> | <b>Est Prob Distributio Function</b> | <b>Evaluation Stocking Level</b> | <b>Evaluation Ratio</b> |                   |
| 1                          | 1575                             | 7.3620                    | 0.00%                               | 0.0000019                            | 1575                             | 0.0259740               |                   |
| 2                          | 3150                             | 8.0552                    | 0.01%                               | 0.0000858                            | 3150                             | 0.0254231               |                   |
| 3                          | 4725                             | 8.4606                    | 0.06%                               | 0.0005087                            | 4725                             | 0.0221555               |                   |
| 4                          | 6300                             | 8.7483                    | 0.20%                               | 0.0014066                            | 6300                             | 0.0182409               |                   |
| 5                          | 7875                             | 8.9714                    | 0.47%                               | 0.0027105                            | 7875                             | 0.0149364               |                   |
| 6                          | 9450                             | 9.1538                    | 0.90%                               | 0.0042736                            | 9450                             | 0.0123515               |                   |
| 7                          | 11025                            | 9.3079                    | 1.49%                               | 0.0059533                            | 11025                            | 0.0103499               |                   |
| 8                          | 12600                            | 9.4415                    | 2.26%                               | 0.0076377                            | 12600                            | 0.0087864               |                   |
| 9                          | 14175                            | 9.5592                    | 3.18%                               | 0.0092489                            | 14175                            | 0.0075480               |                   |
| 10                         | 15750                            | 9.6646                    | 4.26%                               | 0.0107379                            | 15750                            | 0.0065525               |                   |
| 11                         | 17325                            | 9.7599                    | 5.46%                               | 0.0120771                            | 17325                            | 0.0057409               |                   |
| 12                         | 18900                            | 9.8469                    | 6.79%                               | 0.0132545                            | 18900                            | 0.0050706               |                   |
| 13                         | 20475                            | 9.9270                    | 8.22%                               | 0.0142683                            | 20475                            | 0.0045105               |                   |
| 14                         | 22050                            | 10.0011                   | 9.73%                               | 0.0151235                            | 22050                            | 0.0040377               |                   |
| 15                         | 23625                            | 10.0701                   | 11.31%                              | 0.0158293                            | 23625                            | 0.0036347               |                   |
| 16                         | 25200                            | 10.1346                   | 12.95%                              | 0.0163969                            | 25200                            | 0.0032884               |                   |
| 17                         | 26775                            | 10.1952                   | 14.64%                              | 0.0168388                            | 26775                            | 0.0029885               |                   |
| 18                         | 28350                            | 10.2524                   | 16.35%                              | 0.0171678                            | 28350                            | 0.0027270               |                   |
| 19                         | 29925                            | 10.3064                   | 18.09%                              | 0.0173961                            | 29925                            | 0.0024975               |                   |
| 20                         | 31500                            | 10.3577                   | 19.85%                              | 0.0175354                            | 31500                            | 0.0022951               |                   |
| 21                         | 33075                            | 10.4065                   | 21.60%                              | 0.0175967                            | 33075                            | 0.0021155               |                   |
| 22                         | 34650                            | 10.4531                   | 23.36%                              | 0.0175901                            | 34650                            | 0.0019555               |                   |
| 23                         | 36225                            | 10.4975                   | 25.12%                              | 0.0175246                            | 36225                            | 0.0018123               |                   |
| 24                         | 37800                            | 10.5401                   | 26.86%                              | 0.0174085                            | 37800                            | 0.0016836               |                   |
| 25                         | 39375                            | 10.5809                   | <b>28.58%</b>                       | 0.0172491                            | 39375                            | 0.0015675               | <b>Pacific</b>    |
| 26                         | 40950                            | 10.6201                   | 30.29%                              | 0.0170531                            | 40950                            | 0.0014624               |                   |
| 27                         | 42525                            | 10.6578                   | 31.97%                              | 0.0168262                            | 42525                            | 0.0013670               |                   |
| 28                         | 44100                            | 10.6942                   | 33.63%                              | 0.0165736                            | 44100                            | 0.0012802               |                   |
| 29                         | 45675                            | 10.7293                   | <b>35.26%</b>                       | 0.0162999                            | 45675                            | 0.0012008               | <b>Algorithm-</b> |
| 30                         | 47250                            | 10.7632                   | 36.86%                              | 0.0160090                            | 47250                            | 0.0011282               | <b>Pacific</b>    |
| 31                         | 48825                            | 10.7960                   | 38.43%                              | 0.0157045                            | 48825                            | 0.0010615               |                   |
| 32                         | 50400                            | 10.8277                   | 39.97%                              | 0.0153893                            | 50400                            | 0.0010001               |                   |
| 33                         | 51975                            | 10.8585                   | 41.47%                              | 0.0150662                            | 51975                            | 0.0009435               |                   |
| 34                         | 53550                            | 10.8884                   | 42.95%                              | 0.0147375                            | 53550                            | 0.0008913               |                   |
| 35                         | 55125                            | 10.9174                   | 44.39%                              | 0.0144051                            | 55125                            | 0.0008429               |                   |
| 36                         | 56700                            | 10.9455                   | 45.80%                              | 0.0140709                            | 56700                            | 0.0007981               |                   |
| 37                         | 58275                            | 10.9729                   | 47.17%                              | 0.0137362                            | 58275                            | 0.0007564               |                   |
| 38                         | 59850                            | 10.9996                   | 48.51%                              | 0.0134024                            | 59850                            | 0.0007176               |                   |
| 39                         | 61425                            | 11.0256                   | 49.82%                              | 0.0130707                            | 61425                            | 0.0006815               |                   |
| 40                         | 63000                            | 11.0509                   | <b>51.09%</b>                       | 0.0127418                            | 63000                            | 0.0006478               | <b>Algorithm-</b> |
| 41                         | 64575                            | 11.0756                   | 52.33%                              | 0.0124165                            | 64575                            | 0.0006163               | <b>Atlantic</b>   |
| 42                         | 66150                            | 11.0997                   | 53.54%                              | 0.0120955                            | 66150                            | 0.0005868               |                   |
| 43                         | 67725                            | 11.1232                   | 54.72%                              | 0.0117795                            | 67725                            | 0.0005591               |                   |

| Eaton               |                           |                    |                              |                               |                           |                  |          |
|---------------------|---------------------------|--------------------|------------------------------|-------------------------------|---------------------------|------------------|----------|
| # of pallets levels | Potential Stocking levels | Ln of Stock Levels | Est Cum Distributio Function | Est Prob Distributio Function | Evaluation Stocking Level | Evaluation Ratio |          |
| 44                  | 69300                     | 11.1462            | 55.87%                       | 0.0114687                     | 69300                     | 0.0005332        |          |
| 45                  | 70875                     | 11.1687            | 56.98%                       | 0.0111637                     | 70875                     | 0.0005089        |          |
| 46                  | 72450                     | 11.1907            | 58.07%                       | 0.0108647                     | 72450                     | 0.0004860        |          |
| 47                  | 74025                     | 11.2122            | 59.13%                       | 0.0105718                     | 74025                     | 0.0004644        |          |
| 48                  | 75600                     | 11.2332            | 60.16%                       | 0.0102854                     | 75600                     | 0.0004441        |          |
| 49                  | 77175                     | 11.2538            | 61.16%                       | 0.0100054                     | 77175                     | 0.0004249        |          |
| 50                  | 78750                     | 11.2740            | 62.13%                       | 0.0097320                     | 78750                     | 0.0004069        |          |
| 51                  | 80325                     | 11.2938            | 63.08%                       | 0.0094653                     | 80325                     | 0.0003898        |          |
| 52                  | 81900                     | 11.3133            | 64.00%                       | 0.0092052                     | 81900                     | 0.0003736        |          |
| 53                  | 83475                     | 11.3323            | 64.89%                       | 0.0089517                     | 83475                     | 0.0003583        |          |
| 54                  | 85050                     | 11.3510            | 65.76%                       | 0.0087048                     | 85050                     | 0.0003438        | Atlantic |
| 55                  | 86625                     | 11.3693            | 66.61%                       | 0.0084644                     | 86625                     | 0.0003301        |          |
| 56                  | 88200                     | 11.3874            | 67.43%                       | 0.0082305                     | 88200                     | 0.0003170        |          |
| 57                  | 89775                     | 11.4051            | 68.23%                       | 0.0080030                     | 89775                     | 0.0003047        |          |
| 58                  | 91350                     | 11.4225            | 69.01%                       | 0.0077817                     | 91350                     | 0.0002929        |          |
| 59                  | 92925                     | 11.4395            | 69.77%                       | 0.0075666                     | 92925                     | 0.0002817        |          |
| 60                  | 94500                     | 11.4564            | 70.50%                       | 0.0073575                     | 94500                     | 0.0002711        |          |
| 61                  | 96075                     | 11.4729            | 71.22%                       | 0.0071544                     | 96075                     | 0.0002609        |          |
| 62                  | 97650                     | 11.4891            | 71.91%                       | 0.0069570                     | 97650                     | 0.0002513        |          |
| 63                  | 99225                     | 11.5051            | 72.59%                       | 0.0067654                     | 99225                     | 0.0002421        |          |
| 64                  | 100800                    | 11.5209            | 73.25%                       | 0.0065792                     | 100800                    | 0.0002333        |          |
| 65                  | 102375                    | 11.5364            | 73.89%                       | 0.0063985                     | 102375                    | 0.0002249        |          |
| 66                  | 103950                    | 11.5517            | 74.51%                       | 0.0062230                     | 103950                    | 0.0002169        |          |
| 67                  | 105525                    | 11.5667            | 75.12%                       | 0.0060527                     | 105525                    | 0.0002093        |          |
| 68                  | 107100                    | 11.5815            | 75.70%                       | 0.0058874                     | 107100                    | 0.0002020        |          |
| 69                  | 108675                    | 11.5961            | 76.28%                       | 0.0057269                     | 108675                    | 0.0001950        |          |
| 70                  | 110250                    | 11.6105            | 76.83%                       | 0.0055712                     | 110250                    | 0.0001883        |          |
| 71                  | 111825                    | 11.6247            | 77.38%                       | 0.0054200                     | 111825                    | 0.0001819        |          |
| 72                  | 113400                    | 11.6387            | 77.90%                       | 0.0052734                     | 113400                    | 0.0001758        |          |
| 73                  | 114975                    | 11.6525            | 78.42%                       | 0.0051310                     | 114975                    | 0.0001700        |          |
| 74                  | 116550                    | 11.6661            | 78.92%                       | 0.0049929                     | 116550                    | 0.0001643        |          |
| 75                  | 118125                    | 11.6795            | 79.40%                       | 0.0048589                     | 118125                    | 0.0001589        |          |
| 76                  | 119700                    | 11.6927            | 79.87%                       | 0.0047288                     | 119700                    | 0.0001538        |          |
| 77                  | 121275                    | 11.7058            | 80.33%                       | 0.0046026                     | 121275                    | 0.0001488        |          |
| 78                  | 122850                    | 11.7187            | 80.78%                       | 0.0044801                     | 122850                    | 0.0001440        |          |
| 79                  | 124425                    | 11.7315            | 81.22%                       | 0.0043612                     | 124425                    | 0.0001395        |          |
| 80                  | 126000                    | 11.7440            | 81.64%                       | 0.0042459                     | 126000                    | 0.0001351        |          |
| 81                  | 127575                    | 11.7565            | 82.06%                       | 0.0041339                     | 127575                    | 0.0001309        |          |
| 82                  | 129150                    | 11.7687            | 82.46%                       | 0.0040252                     | 129150                    | 0.0001268        |          |
| 83                  | 130725                    | 11.7809            | 82.85%                       | 0.0039198                     | 130725                    | 0.0001229        |          |
| 84                  | 132300                    | 11.7928            | 83.23%                       | 0.0038174                     | 132300                    | 0.0001191        |          |
| 85                  | 133875                    | 11.8047            | 83.60%                       | 0.0037180                     | 133875                    | 0.0001155        |          |
| 86                  | 135450                    | 11.8164            | 83.97%                       | 0.0036216                     | 135450                    | 0.0001120        |          |
| 87                  | 137025                    | 11.8279            | 84.32%                       | 0.0035279                     | 137025                    | 0.0001087        |          |

| Rankings            |                           |                    |                              |                               |                           |                  |
|---------------------|---------------------------|--------------------|------------------------------|-------------------------------|---------------------------|------------------|
| # of pallets levels | Potential Stocking levels | Ln of Stock Levels | Est Cum Distributio Function | Est Prob Distributio Function | Evaluation Stocking Level | Evaluation Ratio |
| 1                   | 1200                      | 7.0901             | 0.00%                        | 0.0000000                     | 1200                      | 0.0294985        |
| 2                   | 2400                      | 7.7832             | 0.00%                        | 0.0000000                     | 2400                      | 0.0294979        |
| 3                   | 3600                      | 8.1887             | 0.00%                        | 0.0000012                     | 3600                      | 0.0293174        |
| 4                   | 4800                      | 8.4764             | 0.00%                        | 0.0000249                     | 4800                      | 0.0281534        |
| 5                   | 6000                      | 8.6995             | 0.02%                        | 0.0001863                     | 6000                      | 0.0258785        |
| 6                   | 7200                      | 8.8818             | 0.10%                        | 0.0007621                     | 7200                      | 0.0230688        |
| 7                   | 8400                      | 9.0360             | 0.31%                        | 0.0021212                     | 8400                      | 0.0202124        |
| 8                   | 9600                      | 9.1695             | 0.76%                        | 0.0045531                     | 9600                      | 0.0175597        |
| 9                   | 10800                     | 9.2873             | 1.58%                        | 0.0081344                     | 10800                     | 0.0152031        |
| 10                  | 12000                     | 9.3927             | 2.85%                        | 0.0127042                     | 12000                     | 0.0131551        |
| 11                  | 13200                     | 9.4880             | 4.64%                        | 0.0179281                     | 13200                     | 0.0113939        |
| 12                  | 14400                     | 9.5750             | 6.98%                        | 0.0233955                     | 14400                     | 0.0098857        |
| 13                  | 15600                     | 9.6550             | 9.85%                        | 0.0287065                     | 15600                     | 0.0085954        |
| 14                  | 16800                     | 9.7291             | 13.20%                       | 0.0335296                     | 16800                     | 0.0074903        |
| 15                  | 18000                     | 9.7981             | 16.97%                       | 0.0376284                     | 18000                     | 0.0065418        |
| 16                  | 19200                     | 9.8627             | 21.05%                       | 0.0408656                     | 19200                     | 0.0057256        |
| 17                  | 20400                     | 9.9233             | 25.37%                       | 0.0431904                     | 20400                     | 0.0050213        |
| 18                  | 21600                     | 9.9804             | 29.84%                       | 0.0446207                     | 21600                     | 0.0044117        |
| 19                  | 22800                     | 10.0345            | 34.36%                       | 0.0452227                     | 22800                     | 0.0038827        |
| 20                  | 24000                     | 10.0858            | 38.87%                       | 0.0450931                     | 24000                     | 0.0034224        |
| 21                  | 25200                     | 10.1346            | 43.30%                       | 0.0443437                     | 25200                     | 0.0030209        |
| 22                  | 26400                     | 10.1811            | 47.61%                       | 0.0430903                     | 26400                     | 0.0026698        |
| 23                  | 27600                     | 10.2256            | 51.75%                       | 0.0414449                     | 27600                     | 0.0023622        |
| 24                  | 28800                     | 10.2681            | 55.71%                       | 0.0395095                     | 28800                     | 0.0020922        |
| 25                  | 30000                     | 10.3090            | <b>59.44%</b>                | 0.0373752                     | 30000                     | 0.0018547        |
| 26                  | 31200                     | 10.3482            | 62.96%                       | 0.0351197                     | 31200                     | 0.0016456        |
| 27                  | 32400                     | 10.3859            | 66.24%                       | 0.0328075                     | 32400                     | 0.0014611        |
| 28                  | 33600                     | 10.4223            | <b>69.28%</b>                | 0.0304908                     | 33600                     | 0.0012982        |
| 29                  | 34800                     | 10.4574            | 72.11%                       | 0.0282107                     | 34800                     | 0.0011541        |
| 30                  | 36000                     | 10.4913            | 74.71%                       | 0.0259984                     | 36000                     | 0.0010266        |
| 31                  | 37200                     | 10.5241            | 77.09%                       | 0.0238769                     | 37200                     | 0.0009136        |
| 32                  | 38400                     | 10.5558            | 79.28%                       | 0.0218618                     | 38400                     | 0.0008134        |
| 33                  | 39600                     | 10.5866            | <b>81.28%</b>                | 0.0199634                     | 39600                     | 0.0007246        |
| 34                  | 40800                     | 10.6164            | 83.09%                       | 0.0181871                     | 40800                     | 0.0006456        |
| 35                  | 42000                     | 10.6454            | 84.75%                       | 0.0165347                     | 42000                     | 0.0005755        |
| 36                  | 43200                     | 10.6736            | 86.25%                       | 0.0150052                     | 43200                     | 0.0005132        |
| 37                  | 44400                     | 10.7010            | 87.61%                       | 0.0135957                     | 44400                     | 0.0004578        |
| 38                  | 45600                     | 10.7277            | 88.84%                       | 0.0123015                     | 45600                     | 0.0004085        |
| 39                  | 46800                     | 10.7536            | 89.95%                       | 0.0111171                     | 46800                     | 0.0003646        |
| 40                  | 48000                     | 10.7790            | 90.95%                       | 0.0100362                     | 48000                     | 0.0003255        |
| 41                  | 49200                     | 10.8036            | 91.86%                       | 0.0090522                     | 49200                     | 0.0002907        |
| 42                  | 50400                     | 10.8277            | 92.67%                       | 0.0081584                     | 50400                     | 0.0002597        |
| 43                  | 51600                     | 10.8513            | 93.41%                       | 0.0073479                     | 51600                     | 0.0002320        |

| <b>Ground Beef</b>         |                                  |                           |                                     |                                      |                                  |                         |
|----------------------------|----------------------------------|---------------------------|-------------------------------------|--------------------------------------|----------------------------------|-------------------------|
| <b># of pallets levels</b> | <b>Potential Stocking levels</b> | <b>Ln of Stock Levels</b> | <b>Est Cum Distributio Function</b> | <b>Est Prob Distributio Function</b> | <b>Evaluation Stocking Level</b> | <b>Evaluation Ratio</b> |
| 1                          | 1650                             | 7.4085                    | 0.00%                               | 0.0000000                            | 1650                             | 0.0284900               |
| 2                          | 3300                             | 8.1017                    | 0.00%                               | 0.0000000                            | 3300                             | 0.0284895               |
| 3                          | 4950                             | 8.5071                    | 0.00%                               | 0.0000000                            | 4950                             | 0.0283560               |
| 4                          | 6600                             | 8.7948                    | 0.00%                               | 0.0000000                            | 6600                             | 0.0275418               |
| 5                          | 8250                             | 9.0180                    | 0.00%                               | 0.0000004                            | 8250                             | 0.0259363               |
| 6                          | 9900                             | 9.2003                    | 0.00%                               | 0.0000022                            | 9900                             | 0.0238923               |
| 7                          | 11550                            | 9.3544                    | 0.00%                               | 0.0000084                            | 11550                            | 0.0217379               |
| 8                          | 13200                            | 9.4880                    | 0.00%                               | 0.0000246                            | 13200                            | 0.0196617               |
| 9                          | 14850                            | 9.6058                    | 0.01%                               | 0.0000588                            | 14850                            | 0.0177490               |
| 10                         | 16500                            | 9.7111                    | 0.02%                               | 0.0001214                            | 16500                            | 0.0160273               |
| 11                         | 18150                            | 9.8064                    | 0.04%                               | 0.0002235                            | 18150                            | 0.0144953               |
| 12                         | 19800                            | 9.8934                    | 0.08%                               | 0.0003761                            | 19800                            | 0.0131391               |
| 13                         | 21450                            | 9.9735                    | 0.14%                               | 0.0005883                            | 21450                            | 0.0119405               |
| 14                         | 23100                            | 10.0476                   | 0.23%                               | 0.0008674                            | 23100                            | 0.0108806               |
| 15                         | 24750                            | 10.1166                   | 0.35%                               | 0.0012173                            | 24750                            | 0.0099415               |
| 16                         | 26400                            | 10.1811                   | 0.51%                               | 0.0016391                            | 26400                            | 0.0091075               |
| 17                         | 28050                            | 10.2417                   | 0.73%                               | 0.0021312                            | 28050                            | 0.0083647               |
| 18                         | 29700                            | 10.2989                   | 0.99%                               | 0.0026889                            | 29700                            | 0.0077011               |
| 19                         | 31350                            | 10.3530                   | 1.33%                               | 0.0033058                            | 31350                            | 0.0071064               |
| 20                         | 33000                            | 10.4043                   | 1.72%                               | 0.0039738                            | 33000                            | 0.0065718               |
| 21                         | 34650                            | 10.4531                   | 2.19%                               | 0.0046834                            | 34650                            | 0.0060898               |
| 22                         | 36300                            | 10.4996                   | 2.73%                               | 0.0054249                            | 36300                            | 0.0056540               |
| 23                         | 37950                            | 10.5440                   | 3.35%                               | 0.0061879                            | 37950                            | 0.0052588               |
| 24                         | 39600                            | 10.5866                   | 4.05%                               | 0.0069625                            | 39600                            | 0.0048995               |
| 25                         | 41250                            | 10.6274                   | 4.82%                               | 0.0077391                            | 41250                            | 0.0045721               |
| 26                         | 42900                            | 10.6666                   | 5.67%                               | 0.0085088                            | 42900                            | 0.0042729               |
| 27                         | 44550                            | 10.7044                   | 6.60%                               | 0.0092635                            | 44550                            | 0.0039989               |
| 28                         | 46200                            | 10.7407                   | 7.60%                               | 0.0099958                            | 46200                            | 0.0037474               |
| 29                         | 47850                            | 10.7758                   | 8.67%                               | 0.0106994                            | 47850                            | 0.0035162               |
| 30                         | 49500                            | 10.8097                   | 9.81%                               | 0.0113691                            | 49500                            | 0.0033031               |
| 31                         | 51150                            | 10.8425                   | 11.01%                              | 0.0120005                            | 51150                            | 0.0031064               |
| 32                         | 52800                            | 10.8743                   | 12.27%                              | 0.0125900                            | 52800                            | 0.0029244               |
| 33                         | 54450                            | 10.9050                   | 13.58%                              | 0.0131350                            | 54450                            | 0.0027559               |
| 34                         | 56100                            | 10.9349                   | 14.94%                              | 0.0136336                            | 56100                            | 0.0025995               |
| 35                         | 57750                            | 10.9639                   | 16.35%                              | 0.0140848                            | 57750                            | 0.0024542               |
| 36                         | 59400                            | 10.9920                   | 17.80%                              | 0.0144880                            | 59400                            | 0.0023190               |
| 37                         | 61050                            | 11.0194                   | 19.28%                              | 0.0148432                            | 61050                            | 0.0021930               |
| 38                         | 62700                            | 11.0461                   | 20.80%                              | 0.0151509                            | 62700                            | 0.0020754               |
| 39                         | 64350                            | 11.0721                   | 22.34%                              | 0.0154122                            | 64350                            | 0.0019655               |
| 40                         | 66000                            | 11.0974                   | 23.90%                              | 0.0156283                            | 66000                            | 0.0018628               |
| 41                         | 67650                            | 11.1221                   | 25.48%                              | 0.0158007                            | 67650                            | 0.0017665               |
| 42                         | 69300                            | 11.1462                   | 27.08%                              | 0.0159313                            | 69300                            | 0.0016763               |
| 43                         | 70950                            | 11.1697                   | 28.68%                              | 0.0160220                            | 70950                            | 0.0015917               |

| <b>Ground Beef</b>         |                                  |                           |                                     |                                      |                                  |                         |
|----------------------------|----------------------------------|---------------------------|-------------------------------------|--------------------------------------|----------------------------------|-------------------------|
| <b># of pallets levels</b> | <b>Potential Stocking levels</b> | <b>Ln of Stock Levels</b> | <b>Est Cum Distributio Function</b> | <b>Est Prob Distributio Function</b> | <b>Evaluation Stocking Level</b> | <b>Evaluation Ratio</b> |
| 44                         | 72600                            | 11.1927                   | 30.29%                              | 0.0160748                            | 72600                            | 0.0015122               |
| 45                         | 74250                            | 11.2152                   | 31.89%                              | 0.0160920                            | 74250                            | 0.0014374               |
| 46                         | 75900                            | 11.2372                   | 33.50%                              | 0.0160758                            | 75900                            | 0.0013671               |
| 47                         | 77550                            | 11.2587                   | 35.11%                              | 0.0160285                            | 77550                            | 0.0013008               |
| 48                         | 79200                            | 11.2797                   | 36.70%                              | 0.0159522                            | 79200                            | 0.0012383               |
| 49                         | 80850                            | 11.3004                   | <b>38.29%</b>                       | 0.0158493                            | 80850                            | 0.0011794               |
| 50                         | 82500                            | 11.3206                   | 39.86%                              | 0.0157219                            | 82500                            | 0.0011238               |
| 51                         | 84150                            | 11.3404                   | 41.41%                              | 0.0155722                            | 84150                            | 0.0010712               |
| 52                         | 85800                            | 11.3598                   | 42.96%                              | 0.0154021                            | 85800                            | 0.0010215               |
| 53                         | 87450                            | 11.3788                   | 44.48%                              | 0.0152138                            | 87450                            | 0.0009745               |
| 54                         | 89100                            | 11.3975                   | <b>45.98%</b>                       | 0.0150091                            | 89100                            | 0.0009300               |
| 55                         | 90750                            | 11.4159                   | 47.46%                              | 0.0147898                            | 90750                            | 0.0008879               |
| 56                         | 92400                            | 11.4339                   | 48.91%                              | 0.0145577                            | 92400                            | 0.0008479               |
| 57                         | 94050                            | 11.4516                   | 50.34%                              | 0.0143143                            | 94050                            | 0.0008101               |
| 58                         | 95700                            | 11.4690                   | 51.75%                              | 0.0140611                            | 95700                            | 0.0007741               |
| 59                         | 97350                            | 11.4861                   | 53.13%                              | 0.0137996                            | 97350                            | 0.0007400               |
| 60                         | 99000                            | 11.5029                   | 54.48%                              | 0.0135312                            | 99000                            | 0.0007076               |
| 61                         | 100650                           | 11.5194                   | <b>55.81%</b>                       | 0.0132571                            | 100650                           | 0.0006768               |
| 62                         | 102300                           | 11.5357                   | 57.11%                              | 0.0129784                            | 102300                           | 0.0006475               |
| 63                         | 103950                           | 11.5517                   | 58.38%                              | 0.0126962                            | 103950                           | 0.0006196               |
| 64                         | 105600                           | 11.5674                   | <b>59.62%</b>                       | 0.0124116                            | 105600                           | 0.0005931               |
| 65                         | 107250                           | 11.5829                   | 60.83%                              | 0.0121253                            | 107250                           | 0.0005679               |
| 66                         | 108900                           | 11.5982                   | 62.01%                              | 0.0118383                            | 108900                           | 0.0005439               |
| 67                         | 110550                           | 11.6132                   | 63.17%                              | 0.0115513                            | 110550                           | 0.0005210               |
| 68                         | 112200                           | 11.6280                   | 64.30%                              | 0.0112650                            | 112200                           | 0.0004992               |
| 69                         | 113850                           | 11.6426                   | 65.39%                              | 0.0109800                            | 113850                           | 0.0004784               |
| 70                         | 115500                           | 11.6570                   | 66.46%                              | 0.0106969                            | 115500                           | 0.0004585               |
| 71                         | 117150                           | 11.6712                   | 67.50%                              | 0.0104162                            | 117150                           | 0.0004396               |
| 72                         | 118800                           | 11.6852                   | 68.52%                              | 0.0101383                            | 118800                           | 0.0004216               |
| 73                         | 120450                           | 11.6990                   | 69.50%                              | 0.0098636                            | 120450                           | 0.0004043               |
| 74                         | 122100                           | 11.7126                   | 70.46%                              | 0.0095926                            | 122100                           | 0.0003878               |
| 75                         | 123750                           | 11.7260                   | 71.40%                              | 0.0093254                            | 123750                           | 0.0003721               |
| 76                         | 125400                           | 11.7393                   | 72.30%                              | 0.0090624                            | 125400                           | 0.0003571               |
| 77                         | 127050                           | 11.7523                   | 73.18%                              | 0.0088039                            | 127050                           | 0.0003427               |
| 78                         | 128700                           | 11.7652                   | 74.04%                              | 0.0085500                            | 128700                           | 0.0003290               |
| 79                         | 130350                           | 11.7780                   | 74.87%                              | 0.0083008                            | 130350                           | 0.0003159               |
| 80                         | 132000                           | 11.7906                   | 75.67%                              | 0.0080566                            | 132000                           | 0.0003033               |
| 81                         | 133650                           | 11.8030                   | 76.46%                              | 0.0078175                            | 133650                           | 0.0002913               |
| 82                         | 135300                           | 11.8152                   | 77.21%                              | 0.0075835                            | 135300                           | 0.0002798               |
| 83                         | 136950                           | 11.8274                   | 77.95%                              | 0.0073547                            | 136950                           | 0.0002688               |
| 84                         | 138600                           | 11.8393                   | 78.66%                              | 0.0071311                            | 138600                           | 0.0002583               |
| 85                         | 140250                           | 11.8512                   | 79.35%                              | 0.0069129                            | 140250                           | 0.0002482               |
| 86                         | 141900                           | 11.8629                   | 80.02%                              | 0.0066999                            | 141900                           | 0.0002385               |
| 87                         | 143550                           | 11.8744                   | 80.67%                              | 0.0064922                            | 143550                           | 0.0002293               |

| Chicken             |                           |                    |                              |                               |                           |                  |
|---------------------|---------------------------|--------------------|------------------------------|-------------------------------|---------------------------|------------------|
| # of pallets levels | Potential Stocking levels | Ln of Stock Levels | Est Cum Distributio Function | Est Prob Distributio Function | Evaluation Stocking Level | Evaluation Ratio |
| 1                   | 1400                      | 7.2442             |                              |                               | 1400                      |                  |
| 2                   | 2800                      | 7.9374             |                              |                               | 2800                      |                  |
| 3                   | 4200                      | 8.3428             | 0.00%                        | 0.0000000                     | 4200                      | 0.0300752        |
| 4                   | 5600                      | 8.6305             | 0.00%                        | 0.0000000                     | 5600                      | 0.0299430        |
| 5                   | 7000                      | 8.8537             | 0.00%                        | 0.0000000                     | 7000                      | 0.0294569        |
| 6                   | 8400                      | 9.0360             | 0.00%                        | 0.0000000                     | 8400                      | 0.0285073        |
| 7                   | 9800                      | 9.1901             | 0.00%                        | 0.0000000                     | 9800                      | 0.0271885        |
| 8                   | 11200                     | 9.3237             | 0.00%                        | 0.0000000                     | 11200                     | 0.0256500        |
| 9                   | 12600                     | 9.4415             | 0.00%                        | 0.0000001                     | 12600                     | 0.0240212        |
| 10                  | 14000                     | 9.5468             | 0.00%                        | 0.0000003                     | 14000                     | 0.0223923        |
| 11                  | 15400                     | 9.6421             | 0.00%                        | 0.0000009                     | 15400                     | 0.0208188        |
| 12                  | 16800                     | 9.7291             | 0.00%                        | 0.0000023                     | 16800                     | 0.0193310        |
| 13                  | 18200                     | 9.8092             | 0.00%                        | 0.0000052                     | 18200                     | 0.0179434        |
| 14                  | 19600                     | 9.8833             | 0.00%                        | 0.0000109                     | 19600                     | 0.0166600        |
| 15                  | 21000                     | 9.9523             | 0.00%                        | 0.0000209                     | 21000                     | 0.0154790        |
| 16                  | 22400                     | 10.0168            | 0.01%                        | 0.0000372                     | 22400                     | 0.0143956        |
| 17                  | 23800                     | 10.0774            | 0.01%                        | 0.0000625                     | 23800                     | 0.0134030        |
| 18                  | 25200                     | 10.1346            | 0.02%                        | 0.0000997                     | 25200                     | 0.0124942        |
| 19                  | 26600                     | 10.1887            | 0.04%                        | 0.0001521                     | 26600                     | 0.0116618        |
| 20                  | 28000                     | 10.2400            | 0.06%                        | 0.0002229                     | 28000                     | 0.0108988        |
| 21                  | 29400                     | 10.2887            | 0.09%                        | 0.0003156                     | 29400                     | 0.0101989        |
| 22                  | 30800                     | 10.3353            | 0.14%                        | 0.0004334                     | 30800                     | 0.0095559        |
| 23                  | 32200                     | 10.3797            | 0.19%                        | 0.0005792                     | 32200                     | 0.0089644        |
| 24                  | 33600                     | 10.4223            | 0.27%                        | 0.0007555                     | 33600                     | 0.0084195        |
| 25                  | 35000                     | 10.4631            | 0.37%                        | 0.0009642                     | 35000                     | 0.0079169        |
| 26                  | 36400                     | 10.5023            | 0.49%                        | 0.0012066                     | 36400                     | 0.0074524        |
| 27                  | 37800                     | 10.5401            | 0.64%                        | 0.0014834                     | 37800                     | 0.0070226        |
| 28                  | 39200                     | 10.5764            | 0.81%                        | 0.0017945                     | 39200                     | 0.0066243        |
| 29                  | 40600                     | 10.6115            | 1.03%                        | 0.0021392                     | 40600                     | 0.0062546        |
| 30                  | 42000                     | 10.6454            | 1.28%                        | 0.0025162                     | 42000                     | 0.0059110        |
| 31                  | 43400                     | 10.6782            | 1.57%                        | 0.0029236                     | 43400                     | 0.0055912        |
| 32                  | 44800                     | 10.7100            | 1.91%                        | 0.0033589                     | 44800                     | 0.0052931        |
| 33                  | 46200                     | 10.7407            | 2.29%                        | 0.0038193                     | 46200                     | 0.0050150        |
| 34                  | 47600                     | 10.7706            | 2.72%                        | 0.0043014                     | 47600                     | 0.0047551        |
| 35                  | 49000                     | 10.7996            | 3.20%                        | 0.0048019                     | 49000                     | 0.0045119        |
| 36                  | 50400                     | 10.8277            | 3.73%                        | 0.0053169                     | 50400                     | 0.0042842        |
| 37                  | 51800                     | 10.8551            | 4.32%                        | 0.0058426                     | 51800                     | 0.0040706        |
| 38                  | 53200                     | 10.8818            | 4.95%                        | 0.0063753                     | 53200                     | 0.0038702        |
| 39                  | 54600                     | 10.9078            | 5.65%                        | 0.0069111                     | 54600                     | 0.0036818        |
| 40                  | 56000                     | 10.9331            | 6.39%                        | 0.0074462                     | 56000                     | 0.0035046        |
| 41                  | 57400                     | 10.9578            | 7.19%                        | 0.0079771                     | 57400                     | 0.0033378        |
| 42                  | 58800                     | 10.9819            | 8.04%                        | 0.0085003                     | 58800                     | 0.0031806        |
| 43                  | 60200                     | 11.0054            | 8.94%                        | 0.0090126                     | 60200                     | 0.0030323        |

| <b>Chicken</b>             |                                  |                           |                                     |                                      |                                  |                         |                      |
|----------------------------|----------------------------------|---------------------------|-------------------------------------|--------------------------------------|----------------------------------|-------------------------|----------------------|
| <b># of pallets levels</b> | <b>Potential Stocking levels</b> | <b>En of Stock Levels</b> | <b>Est Cum Distributio Function</b> | <b>Est Prob Distributio Function</b> | <b>Evaluation Stocking Level</b> | <b>Evaluation Ratio</b> |                      |
| 44                         | 61600                            | 11.0284                   | 9.89%                               | 0.0095112                            | 61600                            | 0.0028923               |                      |
| 45                         | 63000                            | 11.0509                   | 10.89%                              | 0.0099932                            | 63000                            | 0.0027600               |                      |
| 46                         | 64400                            | 11.0729                   | 11.94%                              | 0.0104564                            | 64400                            | 0.0026349               |                      |
| 47                         | 65800                            | 11.0944                   | 13.02%                              | 0.0108986                            | 65800                            | 0.0025165               |                      |
| 48                         | 67200                            | 11.1154                   | 14.16%                              | 0.0113180                            | 67200                            | 0.0024044               |                      |
| 49                         | 68600                            | 11.1360                   | 15.33%                              | 0.0117130                            | 68600                            | 0.0022982               |                      |
| 50                         | 70000                            | 11.1563                   | 16.54%                              | 0.0120824                            | 70000                            | 0.0021975               |                      |
| 51                         | 71400                            | 11.1761                   | 17.78%                              | 0.0124251                            | 71400                            | 0.0021019               |                      |
| 52                         | 72800                            | 11.1955                   | 19.05%                              | 0.0127404                            | 72800                            | 0.0020111               |                      |
| 53                         | 74200                            | 11.2145                   | 20.36%                              | 0.0130278                            | 74200                            | 0.0019249               |                      |
| 54                         | 75600                            | 11.2332                   | 21.68%                              | 0.0132871                            | 75600                            | 0.0018429               |                      |
| 55                         | 77000                            | 11.2516                   | 23.04%                              | 0.0135181                            | 77000                            | 0.0017649               |                      |
| 56                         | 78400                            | 11.2696                   | 24.41%                              | 0.0137209                            | 78400                            | 0.0016907               |                      |
| 57                         | 79800                            | 11.2873                   | 25.80%                              | 0.0138959                            | 79800                            | 0.0016200               |                      |
| 58                         | 81200                            | 11.3047                   | 27.20%                              | 0.0140435                            | 81200                            | 0.0015527               |                      |
| 59                         | 82600                            | 11.3218                   | 28.62%                              | 0.0141642                            | 82600                            | 0.0014885               |                      |
| 60                         | 84000                            | 11.3386                   | 30.04%                              | 0.0142587                            | 84000                            | 0.0014273               |                      |
| 61                         | 85400                            | 11.3551                   | 31.48%                              | 0.0143278                            | 85400                            | 0.0013690               |                      |
| 62                         | 86800                            | 11.3714                   | <b>32.91%</b>                       | 0.0143724                            | 86800                            | 0.0013133               | <b>Algorithm-</b>    |
| 63                         | 88200                            | 11.3874                   | 34.35%                              | 0.0143935                            | 88200                            | 0.0012601               | <b>Pacific</b>       |
| 64                         | 89600                            | 11.4031                   | 35.79%                              | 0.0143920                            | 89600                            | 0.0012093               |                      |
| 65                         | 91000                            | 11.4186                   | 37.23%                              | 0.0143691                            | 91000                            | 0.0011608               |                      |
| 66                         | 92400                            | 11.4339                   | 38.66%                              | 0.0143257                            | 92400                            | 0.0011144               |                      |
| 67                         | 93800                            | 11.4489                   | 40.09%                              | 0.0142631                            | 93800                            | 0.0010700               |                      |
| 68                         | 95200                            | 11.4637                   | 41.51%                              | 0.0141823                            | 95200                            | 0.0010276               |                      |
| 69                         | 96600                            | 11.4783                   | 42.92%                              | 0.0140844                            | 96600                            | 0.0009870               |                      |
| 70                         | 98000                            | 11.4927                   | 44.31%                              | 0.0139707                            | 98000                            | 0.0009482               |                      |
| 71                         | 99400                            | 11.5069                   | 45.70%                              | 0.0138422                            | 99400                            | 0.0009110               |                      |
| 72                         | 100800                           | 11.5209                   | 47.07%                              | 0.0137000                            | 100800                           | 0.0008754               |                      |
| 73                         | 102200                           | 11.5347                   | 48.42%                              | 0.0135452                            | 102200                           | 0.0008413               |                      |
| 74                         | 103600                           | 11.5483                   | 49.76%                              | 0.0133789                            | 103600                           | 0.0008086               |                      |
| 75                         | 105000                           | 11.5617                   | 51.08%                              | 0.0132020                            | 105000                           | 0.0007773               |                      |
| 76                         | 106400                           | 11.5750                   | 52.38%                              | 0.0130156                            | 106400                           | 0.0007473               |                      |
| 77                         | 107800                           | 11.5880                   | <b>53.66%</b>                       | 0.0128206                            | 107800                           | 0.0007185               | <b>Algorithm-</b>    |
| 78                         | 109200                           | 11.6009                   | 54.92%                              | 0.0126180                            | 109200                           | 0.0006909               | <b>Atlantic</b>      |
| 79                         | 110600                           | 11.6137                   | 56.17%                              | 0.0124087                            | 110600                           | 0.0006645               |                      |
| 80                         | 112000                           | 11.6263                   | 57.38%                              | 0.0121935                            | 112000                           | 0.0006391               |                      |
| 81                         | 113400                           | 11.6387                   | <b>58.58%</b>                       | 0.0119731                            | 113400                           | 0.0006147               | <b>Pacific &amp;</b> |
| 82                         | 114800                           | 11.6509                   | 59.76%                              | 0.0117485                            | 114800                           | 0.0005913               | <b>Atlantic</b>      |
| 83                         | 116200                           | 11.6631                   | 60.91%                              | 0.0115202                            | 116200                           | 0.0005688               |                      |
| 84                         | 117600                           | 11.6750                   | 62.04%                              | 0.0112890                            | 117600                           | 0.0005473               |                      |
| 85                         | 119000                           | 11.6869                   | 63.14%                              | 0.0110556                            | 119000                           | 0.0005266               |                      |
| 86                         | 120400                           | 11.6986                   | 64.23%                              | 0.0108204                            | 120400                           | 0.0005067               |                      |
| 87                         | 121800                           | 11.7101                   | 65.28%                              | 0.0105842                            | 121800                           | 0.0004876               |                      |

| Pri | Item         | Eval Sfk Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|
|     |              |                |            |            | 30.45        |           | 37.50        |       | 38.50        |             | 33.90        |             | 35.10        |         | 33.25        |             |
| 1   | Oven Roast   | 3500           | 0.03284    | 1          | 30.45        |           |              |       |              |             |              |             |              |         |              | 30.45       |
| 2   | Oven Roast   | 5250           | 0.03283    | 2          | 60.90        |           |              |       |              |             |              |             |              |         |              | 60.90       |
| 3   | Oven Roast   | 7000           | 0.03255    | 3          | 91.35        |           |              |       |              |             |              |             |              |         |              | 91.35       |
| 4   | Oven Roast   | 8750           | 0.03153    | 4          | 121.80       |           |              |       |              |             |              |             |              |         |              | 121.80      |
| 5   | Chicken      | 4200           | 0.03008    | 4          | 121.80       |           |              |       |              |             |              |             |              | 1       | 33.25        | 155.05      |
| 6   | Chicken      | 5600           | 0.02994    | 4          | 121.80       |           |              |       |              |             |              |             |              | 2       | 66.50        | 188.30      |
| 7   | Oven Roast   | 10500          | 0.02969    | 5          | 152.25       |           |              |       |              |             |              |             |              | 2       | 66.50        | 218.75      |
| 8   | Frankfurters | 1200           | 0.02950    | 5          | 152.25       |           |              |       | 1            | 33.90       |              |             |              | 2       | 66.50        | 252.65      |
| 9   | Frankfurters | 2400           | 0.02950    | 5          | 152.25       |           |              |       | 2            | 67.80       |              |             |              | 2       | 66.50        | 286.55      |
| 10  | Chicken      | 7000           | 0.02946    | 5          | 152.25       |           |              |       | 2            | 67.80       |              |             |              | 3       | 99.75        | 319.80      |
| 11  | Frankfurters | 3600           | 0.02932    | 5          | 152.25       |           |              |       | 3            | 101.70      |              |             |              | 3       | 99.75        | 353.70      |
| 12  | Chicken      | 8400           | 0.02851    | 5          | 152.25       |           |              |       | 3            | 101.70      |              |             |              | 4       | 133.00       | 386.95      |
| 13  | Ground Beef  | 1650           | 0.02849    | 5          | 152.25       |           |              |       | 3            | 101.70      |              | 1           | 35.10        | 4       | 133.00       | 422.05      |
| 14  | Ground Beef  | 3300           | 0.02849    | 5          | 152.25       |           |              |       | 3            | 101.70      |              | 2           | 70.20        | 4       | 133.00       | 457.15      |
| 15  | Ground Beef  | 4950           | 0.02836    | 5          | 152.25       |           |              |       | 3            | 101.70      |              | 3           | 105.30       | 4       | 133.00       | 492.25      |
| 16  | Frankfurters | 4800           | 0.02815    | 5          | 152.25       |           |              |       | 4            | 135.60      |              | 3           | 105.30       | 4       | 133.00       | 526.15      |
| 17  | Ground Beef  | 6600           | 0.02754    | 5          | 152.25       |           |              |       | 4            | 135.60      |              | 4           | 140.40       | 4       | 133.00       | 561.25      |
| 18  | Oven Roast   | 12250          | 0.02733    | 6          | 182.70       |           |              |       | 4            | 135.60      |              | 4           | 140.40       | 4       | 133.00       | 591.70      |
| 19  | Chicken      | 9800           | 0.02719    | 6          | 182.70       |           |              |       | 4            | 135.60      |              | 4           | 140.40       | 5       | 166.25       | 624.95      |
| 20  | Pork chops   | 1500           | 0.02667    | 6          | 182.70       | 1         | 37.50        |       | 4            | 135.60      |              | 4           | 140.40       | 5       | 166.25       | 662.45      |
| 21  | Pork chops   | 3000           | 0.02661    | 6          | 182.70       | 2         | 75.00        |       | 4            | 135.60      |              | 4           | 140.40       | 5       | 166.25       | 699.95      |
| 22  | Bacon        | 1575           | 0.02597    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 4           | 135.60       | 4           | 140.40       | 5       | 166.25       | 738.45      |
| 23  | Ground Beef  | 8250           | 0.02594    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 4           | 135.60       | 5           | 175.50       | 5       | 166.25       | 773.55      |
| 24  | Frankfurters | 6000           | 0.02588    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 5           | 169.50       | 5           | 175.50       | 5       | 166.25       | 807.45      |
| 25  | Chicken      | 11200          | 0.02565    | 6          | 182.70       | 2         | 75.00        | 1     | 38.50        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 840.70      |
| 26  | Bacon        | 3150           | 0.02542    | 6          | 182.70       | 2         | 75.00        | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 879.20      |
| 27  | Pork chops   | 4500           | 0.02512    | 6          | 182.70       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 916.70      |
| 28  | Oven Roast   | 14000          | 0.02475    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 6       | 199.50       | 947.15      |
| 29  | Chicken      | 12600          | 0.02402    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 5           | 175.50       | 7       | 232.75       | 980.40      |
| 30  | Ground Beef  | 9900           | 0.02389    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 5           | 169.50       | 6           | 210.60       | 7       | 232.75       | 1015.50     |
| 31  | Frankfurters | 7200           | 0.02307    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 6           | 203.40       | 6           | 210.60       | 7       | 232.75       | 1049.40     |
| 32  | Chicken      | 14000          | 0.02239    | 7          | 213.15       | 3         | 112.50       | 2     | 77.00        | 6           | 203.40       | 6           | 210.60       | 8       | 266.00       | 1082.65     |
| 33  | Oven Roast   | 15750          | 0.02218    | 8          | 243.60       | 3         | 112.50       | 2     | 77.00        | 6           | 203.40       | 6           | 210.60       | 8       | 266.00       | 1113.10     |

| Pri | Item         | Eval SIK Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|
| 34  | Bacon        | 4725           | 0.02216    | 8          | 243.60       | 3         | 112.50       | 3     | 115.50       | 6           | 203.40       | 6           | 210.60       | 8       | 266.00       | 1151.60     |
| 35  | Ground Beef  | 11550          | 0.02174    | 8          | 243.60       | 3         | 112.50       | 3     | 115.50       | 6           | 203.40       | 7           | 245.70       | 8       | 266.00       | 1186.70     |
| 36  | Pork chops   | 6000           | 0.02170    | 8          | 243.60       | 4         | 150.00       | 3     | 115.50       | 6           | 203.40       | 7           | 245.70       | 8       | 266.00       | 1224.20     |
| 37  | Chicken      | 15400          | 0.02082    | 8          | 243.60       | 4         | 150.00       | 3     | 115.50       | 6           | 203.40       | 7           | 245.70       | 9       | 299.25       | 1257.45     |
| 38  | Frankfurters | 8400           | 0.02021    | 8          | 243.60       | 4         | 150.00       | 3     | 115.50       | 7           | 237.30       | 7           | 245.70       | 9       | 299.25       | 1291.35     |
| 39  | Oven Roast   | 17500          | 0.01975    | 9          | 274.05       | 4         | 150.00       | 3     | 115.50       | 7           | 237.30       | 7           | 245.70       | 9       | 299.25       | 1321.80     |
| 40  | Ground Beef  | 13200          | 0.01966    | 9          | 274.05       | 4         | 150.00       | 3     | 115.50       | 7           | 237.30       | 8           | 280.80       | 9       | 299.25       | 1356.90     |
| 41  | Chicken      | 16800          | 0.01933    | 9          | 274.05       | 4         | 150.00       | 3     | 115.50       | 7           | 237.30       | 8           | 280.80       | 10      | 332.50       | 1390.15     |
| 42  | Bacon        | 6300           | 0.01824    | 9          | 274.05       | 4         | 150.00       | 4     | 154.00       | 7           | 237.30       | 8           | 280.80       | 10      | 332.50       | 1428.65     |
| 43  | Chicken      | 18200          | 0.01794    | 9          | 274.05       | 4         | 150.00       | 4     | 154.00       | 7           | 237.30       | 8           | 280.80       | 11      | 365.75       | 1461.90     |
| 44  | Pork chops   | 7500           | 0.01792    | 9          | 274.05       | 5         | 187.50       | 4     | 154.00       | 7           | 237.30       | 8           | 280.80       | 11      | 365.75       | 1499.40     |
| 45  | Ground Beef  | 14850          | 0.01775    | 9          | 274.05       | 5         | 187.50       | 4     | 154.00       | 7           | 237.30       | 9           | 315.90       | 11      | 365.75       | 1534.50     |
| 46  | Frankfurters | 9600           | 0.01756    | 9          | 274.05       | 5         | 187.50       | 4     | 154.00       | 8           | 271.20       | 9           | 315.90       | 11      | 365.75       | 1568.40     |
| 47  | Oven Roast   | 19250          | 0.01751    | 10         | 304.50       | 5         | 187.50       | 4     | 154.00       | 8           | 271.20       | 9           | 315.90       | 11      | 365.75       | 1598.85     |
| 48  | Chicken      | 19600          | 0.01666    | 10         | 304.50       | 5         | 187.50       | 4     | 154.00       | 8           | 271.20       | 9           | 315.90       | 12      | 399.00       | 1632.10     |
| 49  | Ground Beef  | 16500          | 0.01603    | 10         | 304.50       | 5         | 187.50       | 4     | 154.00       | 8           | 271.20       | 10          | 351.00       | 12      | 399.00       | 1667.20     |
| 50  | Oven Roast   | 21000          | 0.01549    | 11         | 334.95       | 5         | 187.50       | 4     | 154.00       | 8           | 271.20       | 10          | 351.00       | 12      | 399.00       | 1697.65     |
| 51  | Chicken      | 21000          | 0.01548    | 11         | 334.95       | 5         | 187.50       | 4     | 154.00       | 8           | 271.20       | 10          | 351.00       | 13      | 432.25       | 1730.90     |
| 52  | Frankfurters | 10800          | 0.01520    | 11         | 334.95       | 5         | 187.50       | 4     | 154.00       | 9           | 305.10       | 10          | 351.00       | 13      | 432.25       | 1764.80     |
| 53  | Bacon        | 7875           | 0.01494    | 11         | 334.95       | 5         | 187.50       | 5     | 192.50       | 9           | 305.10       | 10          | 351.00       | 13      | 432.25       | 1803.30     |
| 54  | Pork chops   | 9000           | 0.01457    | 11         | 334.95       | 6         | 225.00       | 5     | 192.50       | 9           | 305.10       | 10          | 351.00       | 13      | 432.25       | 1840.80     |
| 55  | Ground Beef  | 18150          | 0.01450    | 11         | 334.95       | 6         | 225.00       | 5     | 192.50       | 9           | 305.10       | 11          | 386.10       | 13      | 432.25       | 1875.90     |
| 56  | Chicken      | 22400          | 0.01440    | 11         | 334.95       | 6         | 225.00       | 5     | 192.50       | 9           | 305.10       | 11          | 386.10       | 14      | 465.50       | 1909.15     |
| 57  | Oven Roast   | 22750          | 0.01369    | 12         | 365.40       | 6         | 225.00       | 5     | 192.50       | 9           | 305.10       | 11          | 386.10       | 14      | 465.50       | 1939.60     |
| 58  | Chicken      | 23600          | 0.01340    | 12         | 365.40       | 6         | 225.00       | 5     | 192.50       | 9           | 305.10       | 11          | 386.10       | 15      | 498.75       | 1972.85     |
| 59  | Frankfurters | 12000          | 0.01316    | 12         | 365.40       | 6         | 225.00       | 5     | 192.50       | 10          | 339.00       | 11          | 386.10       | 15      | 498.75       | 2006.75     |
| 60  | Ground Beef  | 19800          | 0.01314    | 12         | 365.40       | 6         | 225.00       | 5     | 192.50       | 10          | 339.00       | 12          | 421.20       | 15      | 498.75       | 2041.85     |
| 61  | Chicken      | 25200          | 0.01249    | 12         | 365.40       | 6         | 225.00       | 5     | 192.50       | 10          | 339.00       | 12          | 421.20       | 16      | 532.00       | 2075.10     |
| 62  | Bacon        | 9450           | 0.01235    | 12         | 365.40       | 6         | 225.00       | 6     | 231.00       | 10          | 339.00       | 12          | 421.20       | 16      | 532.00       | 2113.60     |
| 63  | Oven Roast   | 24500          | 0.01209    | 13         | 395.85       | 6         | 225.00       | 6     | 231.00       | 10          | 339.00       | 12          | 421.20       | 16      | 532.00       | 2144.05     |
| 64  | Ground Beef  | 21450          | 0.01194    | 13         | 395.85       | 6         | 225.00       | 6     | 231.00       | 10          | 339.00       | 13          | 456.30       | 16      | 532.00       | 2179.15     |
| 65  | Pork chops   | 10500          | 0.01184    | 13         | 395.85       | 7         | 262.50       | 6     | 231.00       | 10          | 339.00       | 13          | 456.30       | 16      | 532.00       | 2216.65     |
| 66  | Chicken      | 26600          | 0.01166    | 13         | 395.85       | 7         | 262.50       | 6     | 231.00       | 10          | 339.00       | 13          | 456.30       | 17      | 565.25       | 2249.90     |
| 67  | Frankfurters | 13200          | 0.01139    | 13         | 395.85       | 7         | 262.50       | 6     | 231.00       | 11          | 372.90       | 13          | 456.30       | 17      | 565.25       | 2283.80     |
| 68  | Chicken      | 28000          | 0.01090    | 13         | 395.85       | 7         | 262.50       | 6     | 231.00       | 11          | 372.90       | 13          | 456.30       | 18      | 598.50       | 2317.05     |
| 69  | Ground Beef  | 23100          | 0.01088    | 13         | 395.85       | 7         | 262.50       | 6     | 231.00       | 11          | 372.90       | 14          | 491.40       | 18      | 598.50       | 2352.15     |
| 70  | Oven Roast   | 26250          | 0.01068    | 14         | 426.30       | 7         | 262.50       | 6     | 231.00       | 11          | 372.90       | 14          | 491.40       | 18      | 598.50       | 2382.60     |

| Pri | Item         | Eval Slt Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frank-furter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|--------------|--------------|-------------|--------------|---------|--------------|-------------|
| 71  | Bacon        | 11025          | 0.01035    | 14         | 426.30       | 7         | 262.50       | 7     | 269.50       | 11           | 372.90       | 14          | 491.40       | 18      | 598.50       | 2421.10     |
| 72  | Chicken      | 29400          | 0.01020    | 14         | 426.30       | 7         | 262.50       | 7     | 269.50       | 11           | 372.90       | 14          | 491.40       | 19      | 631.75       | 2454.35     |
| 73  | Ground Beef  | 24750          | 0.00994    | 14         | 426.30       | 7         | 262.50       | 7     | 269.50       | 11           | 372.90       | 15          | 526.50       | 19      | 631.75       | 2489.45     |
| 74  | Frankfurters | 14400          | 0.00989    | 14         | 426.30       | 7         | 262.50       | 7     | 269.50       | 12           | 406.80       | 15          | 526.50       | 19      | 631.75       | 2523.35     |
| 75  | Pork chops   | 12000          | 0.00965    | 14         | 426.30       | 8         | 300.00       | 7     | 269.50       | 12           | 406.80       | 15          | 526.50       | 19      | 631.75       | 2560.85     |
| 76  | Chicken      | 30800          | 0.00956    | 14         | 426.30       | 8         | 300.00       | 7     | 269.50       | 12           | 406.80       | 15          | 526.50       | 20      | 665.00       | 2594.10     |
| 77  | Oven Roast   | 28000          | 0.00944    | 15         | 456.75       | 8         | 300.00       | 7     | 269.50       | 12           | 406.80       | 15          | 526.50       | 20      | 665.00       | 2624.55     |
| 78  | Ground Beef  | 26400          | 0.00911    | 15         | 456.75       | 8         | 300.00       | 7     | 269.50       | 12           | 406.80       | 16          | 561.60       | 20      | 665.00       | 2659.65     |
| 79  | Chicken      | 32200          | 0.00896    | 15         | 456.75       | 8         | 300.00       | 7     | 269.50       | 12           | 406.80       | 16          | 561.60       | 21      | 698.25       | 2692.90     |
| 80  | Bacon        | 12600          | 0.00879    | 15         | 456.75       | 8         | 300.00       | 8     | 308.00       | 12           | 406.80       | 16          | 561.60       | 21      | 698.25       | 2731.40     |
| 81  | Frankfurters | 15600          | 0.00860    | 15         | 456.75       | 8         | 300.00       | 8     | 308.00       | 13           | 440.70       | 16          | 561.60       | 21      | 698.25       | 2765.30     |
| 82  | Chicken      | 33600          | 0.00842    | 15         | 456.75       | 8         | 300.00       | 8     | 308.00       | 13           | 440.70       | 16          | 561.60       | 22      | 731.50       | 2798.55     |
| 83  | Ground Beef  | 28050          | 0.00836    | 15         | 456.75       | 8         | 300.00       | 8     | 308.00       | 13           | 440.70       | 17          | 596.70       | 22      | 731.50       | 2833.65     |
| 84  | Oven Roast   | 29750          | 0.00834    | 16         | 487.20       | 8         | 300.00       | 8     | 308.00       | 13           | 440.70       | 17          | 596.70       | 23      | 764.75       | 2897.35     |
| 85  | Chicken      | 35000          | 0.00792    | 16         | 487.20       | 9         | 337.50       | 8     | 308.00       | 13           | 440.70       | 17          | 596.70       | 23      | 764.75       | 2934.85     |
| 86  | Pork chops   | 13500          | 0.00792    | 16         | 487.20       | 9         | 337.50       | 8     | 308.00       | 13           | 440.70       | 18          | 631.80       | 23      | 764.75       | 2969.95     |
| 87  | Ground Beef  | 29700          | 0.00770    | 16         | 487.20       | 9         | 337.50       | 8     | 308.00       | 13           | 440.70       | 18          | 631.80       | 23      | 764.75       | 3008.45     |
| 88  | Bacon        | 14175          | 0.00755    | 16         | 487.20       | 9         | 337.50       | 9     | 346.50       | 14           | 474.60       | 18          | 631.80       | 24      | 798.00       | 3075.60     |
| 89  | Frankfurters | 16800          | 0.00749    | 16         | 487.20       | 9         | 337.50       | 9     | 346.50       | 14           | 474.60       | 18          | 631.80       | 24      | 798.00       | 3106.05     |
| 90  | Chicken      | 36400          | 0.00745    | 16         | 487.20       | 9         | 337.50       | 9     | 346.50       | 14           | 474.60       | 19          | 666.90       | 24      | 798.00       | 3141.15     |
| 91  | Oven Roast   | 31500          | 0.00737    | 17         | 517.65       | 9         | 337.50       | 9     | 346.50       | 14           | 474.60       | 19          | 666.90       | 25      | 831.25       | 3174.40     |
| 92  | Ground Beef  | 31350          | 0.00711    | 17         | 517.65       | 9         | 337.50       | 9     | 346.50       | 14           | 474.60       | 19          | 666.90       | 26      | 864.50       | 3207.65     |
| 93  | Chicken      | 37800          | 0.00702    | 17         | 517.65       | 9         | 337.50       | 9     | 346.50       | 14           | 474.60       | 20          | 702.00       | 26      | 864.50       | 3242.75     |
| 94  | Chicken      | 39200          | 0.00662    | 17         | 517.65       | 9         | 337.50       | 10    | 385.00       | 14           | 474.60       | 20          | 702.00       | 26      | 864.50       | 3281.25     |
| 95  | Ground Beef  | 33000          | 0.00657    | 17         | 517.65       | 9         | 337.50       | 10    | 385.00       | 15           | 508.50       | 20          | 702.00       | 26      | 864.50       | 3315.15     |
| 96  | Bacon        | 15750          | 0.00655    | 17         | 517.65       | 9         | 337.50       | 10    | 385.00       | 15           | 508.50       | 20          | 702.00       | 26      | 864.50       | 3352.65     |
| 97  | Frankfurters | 18000          | 0.00654    | 17         | 517.65       | 10        | 375.00       | 10    | 385.00       | 15           | 508.50       | 20          | 702.00       | 26      | 864.50       | 3383.10     |
| 98  | Pork chops   | 15000          | 0.00653    | 17         | 517.65       | 10        | 375.00       | 10    | 385.00       | 15           | 508.50       | 20          | 702.00       | 26      | 864.50       | 3416.35     |
| 99  | Oven Roast   | 33250          | 0.00652    | 18         | 548.10       | 10        | 375.00       | 10    | 385.00       | 15           | 508.50       | 20          | 702.00       | 27      | 897.75       | 3451.45     |
| 100 | Chicken      | 40600          | 0.00625    | 18         | 548.10       | 10        | 375.00       | 10    | 385.00       | 15           | 508.50       | 21          | 737.10       | 27      | 897.75       | 3484.70     |
| 101 | Ground Beef  | 34650          | 0.00609    | 18         | 548.10       | 10        | 375.00       | 10    | 385.00       | 15           | 508.50       | 21          | 737.10       | 28      | 931.00       | 3515.15     |
| 102 | Chicken      | 42000          | 0.00591    | 18         | 548.10       | 10        | 375.00       | 10    | 385.00       | 15           | 508.50       | 21          | 737.10       | 28      | 931.00       | 3553.65     |
| 103 | Oven Roast   | 35000          | 0.00577    | 19         | 578.55       | 10        | 375.00       | 11    | 423.50       | 16           | 542.40       | 21          | 737.10       | 28      | 931.00       | 3587.55     |
| 104 | Bacon        | 17325          | 0.00574    | 19         | 578.55       | 10        | 375.00       | 11    | 423.50       | 16           | 542.40       | 22          | 772.20       | 28      | 931.00       | 3622.65     |
| 105 | Frankfurters | 19200          | 0.00573    | 19         | 578.55       | 10        | 375.00       | 11    | 423.50       | 16           | 542.40       | 22          | 772.20       | 29      | 964.25       | 3655.90     |
| 106 | Ground Beef  | 36300          | 0.00565    | 19         | 578.55       | 10        | 375.00       | 11    | 423.50       | 16           | 542.40       | 22          | 772.20       | 29      | 964.25       | 3655.90     |
| 107 | Chicken      | 43400          | 0.00559    | 19         | 578.55       | 10        | 375.00       | 11    | 423.50       | 16           | 542.40       | 22          | 772.20       | 29      | 964.25       | 3655.90     |

| Pri | Item         | Eval Stk Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |         |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|---------|
| 108 | Pork chops   | 16500          | 0.00543    | 19         | 578.55       | 11        | 412.50       | 11    | 412.50       | 16          | 423.50       | 22          | 542.40       | 29      | 772.20       | 964.25      | 3693.40 |
| 109 | Chicken      | 44800          | 0.00529    | 19         | 578.55       | 11        | 412.50       | 11    | 412.50       | 16          | 423.50       | 22          | 542.40       | 30      | 772.20       | 997.50      | 3726.65 |
| 110 | Ground Beef  | 37950          | 0.00526    | 19         | 578.55       | 11        | 412.50       | 11    | 412.50       | 16          | 423.50       | 23          | 542.40       | 30      | 807.30       | 997.50      | 3761.75 |
| 111 | Oven Roast   | 36750          | 0.00510    | 20         | 609.00       | 11        | 412.50       | 11    | 412.50       | 16          | 423.50       | 23          | 542.40       | 30      | 807.30       | 997.50      | 3792.20 |
| 112 | Bacon        | 18900          | 0.00507    | 20         | 609.00       | 11        | 412.50       | 12    | 412.50       | 16          | 462.00       | 23          | 542.40       | 30      | 807.30       | 997.50      | 3830.70 |
| 113 | Frankfurters | 20400          | 0.00502    | 20         | 609.00       | 11        | 412.50       | 12    | 412.50       | 17          | 462.00       | 23          | 576.30       | 30      | 807.30       | 997.50      | 3864.60 |
| 114 | Chicken      | 46200          | 0.00501    | 20         | 609.00       | 11        | 412.50       | 12    | 412.50       | 17          | 462.00       | 23          | 576.30       | 31      | 807.30       | 1030.75     | 3897.85 |
| 115 | Ground Beef  | 39600          | 0.00490    | 20         | 609.00       | 11        | 412.50       | 12    | 412.50       | 17          | 462.00       | 24          | 576.30       | 31      | 842.40       | 1030.75     | 3932.95 |
| 116 | Chicken      | 47600          | 0.00476    | 20         | 609.00       | 11        | 412.50       | 12    | 412.50       | 17          | 462.00       | 24          | 576.30       | 32      | 842.40       | 1064.00     | 3966.20 |
| 117 | Ground Beef  | 41250          | 0.00457    | 20         | 609.00       | 11        | 412.50       | 12    | 412.50       | 17          | 462.00       | 25          | 576.30       | 32      | 877.50       | 1064.00     | 4001.30 |
| 118 | Pork chops   | 18000          | 0.00453    | 20         | 609.00       | 12        | 450.00       | 12    | 450.00       | 17          | 462.00       | 25          | 576.30       | 32      | 877.50       | 1064.00     | 4038.80 |
| 119 | Oven Roast   | 38500          | 0.00452    | 21         | 639.45       | 12        | 450.00       | 12    | 450.00       | 17          | 462.00       | 25          | 576.30       | 32      | 877.50       | 1064.00     | 4069.25 |
| 120 | Chicken      | 49000          | 0.00451    | 21         | 639.45       | 12        | 450.00       | 12    | 450.00       | 17          | 462.00       | 25          | 576.30       | 33      | 877.50       | 1097.25     | 4102.50 |
| 121 | Bacon        | 20475          | 0.00451    | 21         | 639.45       | 12        | 450.00       | 13    | 450.00       | 17          | 500.50       | 25          | 576.30       | 33      | 877.50       | 1097.25     | 4141.00 |
| 122 | Frankfurters | 21600          | 0.00441    | 21         | 639.45       | 12        | 450.00       | 13    | 450.00       | 18          | 500.50       | 25          | 610.20       | 33      | 877.50       | 1097.25     | 4174.90 |
| 123 | Chicken      | 50400          | 0.00428    | 21         | 639.45       | 12        | 450.00       | 13    | 450.00       | 18          | 500.50       | 25          | 610.20       | 34      | 877.50       | 1130.50     | 4208.15 |
| 124 | Ground Beef  | 42900          | 0.00427    | 21         | 639.45       | 12        | 450.00       | 13    | 450.00       | 18          | 500.50       | 26          | 610.20       | 34      | 912.60       | 1130.50     | 4243.25 |
| 125 | Chicken      | 51800          | 0.00407    | 21         | 639.45       | 12        | 450.00       | 13    | 450.00       | 18          | 500.50       | 26          | 610.20       | 35      | 912.60       | 1163.75     | 4276.50 |
| 126 | Bacon        | 22050          | 0.00404    | 21         | 639.45       | 12        | 450.00       | 14    | 450.00       | 18          | 539.00       | 26          | 610.20       | 35      | 912.60       | 1163.75     | 4315.00 |
| 127 | Ground Beef  | 44550          | 0.00400    | 21         | 639.45       | 12        | 450.00       | 14    | 450.00       | 18          | 539.00       | 27          | 610.20       | 35      | 947.70       | 1163.75     | 4350.10 |
| 128 | Oven Roast   | 40250          | 0.00400    | 22         | 669.90       | 12        | 450.00       | 14    | 450.00       | 18          | 539.00       | 27          | 610.20       | 35      | 947.70       | 1163.75     | 4380.55 |
| 129 | Frankfurters | 22800          | 0.00388    | 22         | 669.90       | 12        | 450.00       | 14    | 450.00       | 19          | 539.00       | 27          | 644.10       | 35      | 947.70       | 1163.75     | 4414.45 |
| 130 | Chicken      | 53200          | 0.00387    | 22         | 669.90       | 12        | 450.00       | 14    | 450.00       | 19          | 539.00       | 27          | 644.10       | 36      | 947.70       | 1197.00     | 4447.70 |
| 131 | Pork chops   | 19500          | 0.00381    | 22         | 669.90       | 13        | 487.50       | 14    | 487.50       | 19          | 539.00       | 27          | 644.10       | 36      | 947.70       | 1197.00     | 4485.20 |
| 132 | Ground Beef  | 46200          | 0.00375    | 22         | 669.90       | 13        | 487.50       | 14    | 487.50       | 19          | 539.00       | 28          | 644.10       | 36      | 982.80       | 1197.00     | 4520.30 |
| 133 | Chicken      | 54600          | 0.00368    | 22         | 669.90       | 13        | 487.50       | 14    | 487.50       | 19          | 539.00       | 28          | 644.10       | 37      | 982.80       | 1230.25     | 4553.55 |
| 134 | Bacon        | 23625          | 0.00363    | 22         | 669.90       | 13        | 487.50       | 15    | 487.50       | 19          | 577.50       | 28          | 644.10       | 37      | 982.80       | 1230.25     | 4592.05 |
| 135 | Oven Roast   | 42000          | 0.00354    | 23         | 700.35       | 13        | 487.50       | 15    | 487.50       | 19          | 577.50       | 28          | 644.10       | 37      | 982.80       | 1230.25     | 4622.50 |
| 136 | Ground Beef  | 47850          | 0.00352    | 23         | 700.35       | 13        | 487.50       | 15    | 487.50       | 19          | 577.50       | 29          | 644.10       | 37      | 1017.90      | 1230.25     | 4657.60 |
| 137 | Chicken      | 56000          | 0.00350    | 23         | 700.35       | 13        | 487.50       | 15    | 487.50       | 19          | 577.50       | 29          | 644.10       | 38      | 1017.90      | 1263.50     | 4690.85 |
| 138 | Frankfurters | 24000          | 0.00342    | 23         | 700.35       | 13        | 487.50       | 15    | 487.50       | 20          | 577.50       | 29          | 678.00       | 38      | 1017.90      | 1263.50     | 4724.75 |
| 139 | Chicken      | 57400          | 0.00334    | 23         | 700.35       | 13        | 487.50       | 15    | 487.50       | 20          | 577.50       | 29          | 678.00       | 39      | 1017.90      | 1296.75     | 4758.00 |
| 140 | Ground Beef  | 49500          | 0.00330    | 23         | 700.35       | 13        | 487.50       | 15    | 487.50       | 20          | 577.50       | 30          | 678.00       | 39      | 1053.00      | 1296.75     | 4793.10 |
| 141 | Bacon        | 25200          | 0.00329    | 23         | 700.35       | 13        | 487.50       | 16    | 487.50       | 20          | 616.00       | 30          | 678.00       | 39      | 1053.00      | 1296.75     | 4831.60 |
| 142 | Pork chops   | 21000          | 0.00321    | 23         | 700.35       | 14        | 525.00       | 16    | 525.00       | 20          | 616.00       | 30          | 678.00       | 39      | 1053.00      | 1296.75     | 4869.10 |
| 143 | Chicken      | 58800          | 0.00318    | 23         | 700.35       | 14        | 525.00       | 16    | 525.00       | 20          | 616.00       | 30          | 678.00       | 40      | 1053.00      | 1330.00     | 4902.35 |
| 144 | Oven Roast   | 43750          | 0.00313    | 24         | 730.80       | 14        | 525.00       | 16    | 525.00       | 20          | 616.00       | 30          | 678.00       | 40      | 1053.00      | 1330.00     | 4932.80 |

| Pri | Item         | Eval Sltk Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|-----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|
| 145 | Ground Beef  | 51150           | 0.00311    | 24         | 730.80       | 14        | 525.00       | 16    | 616.00       | 20          | 678.00       | 31          | 1088.10      | 40      | 1330.00      | 4967.90     |
| 146 | Chicken      | 60200           | 0.00303    | 24         | 730.80       | 14        | 525.00       | 16    | 616.00       | 20          | 678.00       | 31          | 1088.10      | 41      | 1363.25      | 5001.15     |
| 147 | Frankfurters | 25200           | 0.00302    | 24         | 730.80       | 14        | 525.00       | 16    | 616.00       | 21          | 711.90       | 31          | 1088.10      | 41      | 1363.25      | 5035.05     |
| 148 | Bacon        | 26775           | 0.00299    | 24         | 730.80       | 14        | 525.00       | 17    | 654.50       | 21          | 711.90       | 31          | 1088.10      | 41      | 1363.25      | 5073.55     |
| 149 | Ground Beef  | 52800           | 0.00292    | 24         | 730.80       | 14        | 525.00       | 17    | 654.50       | 21          | 711.90       | 32          | 1123.20      | 41      | 1363.25      | 5108.65     |
| 150 | Chicken      | 61600           | 0.00289    | 24         | 730.80       | 14        | 525.00       | 17    | 654.50       | 21          | 711.90       | 32          | 1123.20      | 42      | 1396.50      | 5141.90     |
| 151 | Oven Roast   | 45500           | 0.00277    | 25         | 761.25       | 14        | 525.00       | 17    | 654.50       | 21          | 711.90       | 32          | 1123.20      | 42      | 1396.50      | 5172.35     |
| 152 | Chicken      | 63000           | 0.00276    | 25         | 761.25       | 14        | 525.00       | 17    | 654.50       | 21          | 711.90       | 32          | 1123.20      | 43      | 1429.75      | 5205.60     |
| 153 | Ground Beef  | 54450           | 0.00276    | 25         | 761.25       | 14        | 525.00       | 17    | 654.50       | 21          | 711.90       | 33          | 1158.30      | 43      | 1429.75      | 5240.70     |
| 154 | Bacon        | 28350           | 0.00273    | 25         | 761.25       | 14        | 525.00       | 18    | 693.00       | 21          | 711.90       | 33          | 1158.30      | 43      | 1429.75      | 5279.20     |
| 155 | Pork chops   | 22500           | 0.00272    | 25         | 761.25       | 15        | 562.50       | 18    | 693.00       | 21          | 711.90       | 33          | 1158.30      | 43      | 1429.75      | 5316.70     |
| 156 | Frankfurters | 26400           | 0.00267    | 25         | 761.25       | 15        | 562.50       | 18    | 693.00       | 22          | 745.80       | 33          | 1158.30      | 43      | 1429.75      | 5350.60     |
| 157 | Chicken      | 64400           | 0.00263    | 25         | 761.25       | 15        | 562.50       | 18    | 693.00       | 22          | 745.80       | 33          | 1158.30      | 44      | 1463.00      | 5383.85     |
| 158 | Ground Beef  | 56100           | 0.00260    | 25         | 761.25       | 15        | 562.50       | 18    | 693.00       | 22          | 745.80       | 34          | 1193.40      | 44      | 1463.00      | 5418.95     |
| 159 | Chicken      | 65800           | 0.00252    | 25         | 761.25       | 15        | 562.50       | 18    | 693.00       | 22          | 745.80       | 34          | 1193.40      | 45      | 1496.25      | 5452.20     |
| 160 | Bacon        | 29925           | 0.00250    | 25         | 761.25       | 15        | 562.50       | 19    | 731.50       | 22          | 745.80       | 34          | 1193.40      | 45      | 1496.25      | 5490.70     |
| 161 | Ground Beef  | 57750           | 0.00245    | 25         | 761.25       | 15        | 562.50       | 19    | 731.50       | 22          | 745.80       | 35          | 1228.50      | 45      | 1496.25      | 5525.80     |
| 162 | Oven Roast   | 47250           | 0.00245    | 26         | 791.70       | 15        | 562.50       | 19    | 731.50       | 22          | 745.80       | 35          | 1228.50      | 45      | 1496.25      | 5556.25     |
| 163 | Chicken      | 67200           | 0.00240    | 26         | 791.70       | 15        | 562.50       | 19    | 731.50       | 22          | 745.80       | 35          | 1228.50      | 46      | 1529.50      | 5589.50     |
| 164 | Frankfurters | 27600           | 0.00236    | 26         | 791.70       | 15        | 562.50       | 19    | 731.50       | 23          | 779.70       | 35          | 1228.50      | 46      | 1529.50      | 5623.40     |
| 165 | Ground Beef  | 59400           | 0.00232    | 26         | 791.70       | 15        | 562.50       | 19    | 731.50       | 23          | 779.70       | 36          | 1263.60      | 46      | 1529.50      | 5658.50     |
| 166 | Pork chops   | 24000           | 0.00232    | 26         | 791.70       | 16        | 600.00       | 19    | 731.50       | 23          | 779.70       | 36          | 1263.60      | 46      | 1529.50      | 5696.00     |
| 167 | Chicken      | 68600           | 0.00230    | 26         | 791.70       | 16        | 600.00       | 19    | 731.50       | 23          | 779.70       | 36          | 1263.60      | 47      | 1562.75      | 5729.25     |
| 168 | Bacon        | 31500           | 0.00230    | 26         | 791.70       | 16        | 600.00       | 20    | 770.00       | 23          | 779.70       | 36          | 1263.60      | 47      | 1562.75      | 5767.75     |
| 169 | Chicken      | 70000           | 0.00220    | 26         | 791.70       | 16        | 600.00       | 20    | 770.00       | 23          | 779.70       | 36          | 1263.60      | 48      | 1596.00      | 5801.00     |
| 170 | Ground Beef  | 61050           | 0.00219    | 26         | 791.70       | 16        | 600.00       | 20    | 770.00       | 23          | 779.70       | 37          | 1298.70      | 48      | 1596.00      | 5836.10     |
| 171 | Oven Roast   | 49000           | 0.00217    | 27         | 822.15       | 16        | 600.00       | 20    | 770.00       | 23          | 779.70       | 37          | 1298.70      | 48      | 1596.00      | 5866.55     |
| 172 | Bacon        | 33075           | 0.00212    | 27         | 822.15       | 16        | 600.00       | 21    | 808.50       | 23          | 779.70       | 37          | 1298.70      | 48      | 1596.00      | 5905.05     |
| 173 | Chicken      | 71400           | 0.00210    | 27         | 822.15       | 16        | 600.00       | 21    | 808.50       | 23          | 779.70       | 37          | 1298.70      | 49      | 1629.25      | 5938.30     |
| 174 | Frankfurters | 28800           | 0.00209    | 27         | 822.15       | 16        | 600.00       | 21    | 808.50       | 24          | 813.60       | 37          | 1298.70      | 49      | 1629.25      | 5972.20     |
| 175 | Ground Beef  | 62700           | 0.00208    | 27         | 822.15       | 16        | 600.00       | 21    | 808.50       | 24          | 813.60       | 38          | 1333.80      | 49      | 1629.25      | 6007.30     |
| 176 | Chicken      | 72800           | 0.00201    | 27         | 822.15       | 16        | 600.00       | 21    | 808.50       | 24          | 813.60       | 38          | 1333.80      | 50      | 1662.50      | 6040.55     |
| 177 | Pork chops   | 25500           | 0.00198    | 27         | 822.15       | 17        | 637.50       | 21    | 808.50       | 24          | 813.60       | 38          | 1333.80      | 50      | 1662.50      | 6078.05     |
| 178 | Ground Beef  | 64350           | 0.00197    | 27         | 822.15       | 17        | 637.50       | 21    | 808.50       | 24          | 813.60       | 39          | 1368.90      | 50      | 1662.50      | 6113.15     |
| 179 | Bacon        | 34650           | 0.00196    | 27         | 822.15       | 17        | 637.50       | 22    | 847.00       | 24          | 813.60       | 39          | 1368.90      | 50      | 1662.50      | 6151.65     |
| 180 | Chicken      | 74200           | 0.00192    | 27         | 822.15       | 17        | 637.50       | 22    | 847.00       | 24          | 813.60       | 39          | 1368.90      | 51      | 1695.75      | 6184.90     |
| 181 | Oven Roast   | 50750           | 0.00192    | 28         | 852.60       | 17        | 637.50       | 22    | 847.00       | 24          | 813.60       | 39          | 1368.90      | 51      | 1695.75      | 6215.35     |

| Pri | Item         | Eval SIK Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |         |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|---------|
| 182 | Ground Beef  | 66000          | 0.00186    | 28         | 852.60       | 17        | 637.50       | 22    | 847.00       | 24          | 813.60       | 40          | 1404.00      | 51      | 1404.00      | 1695.75     | 6250.45 |
| 183 | Frankfurters | 30000          | 0.00185    | 28         | 852.60       | 17        | 637.50       | 22    | 847.00       | 25          | 847.50       | 40          | 1404.00      | 51      | 1404.00      | 1695.75     | 6284.35 |
| 184 | Chicken      | 75600          | 0.00184    | 28         | 852.60       | 17        | 637.50       | 22    | 847.00       | 25          | 847.50       | 40          | 1404.00      | 52      | 1404.00      | 1729.00     | 6317.60 |
| 185 | Bacon        | 36225          | 0.00181    | 28         | 852.60       | 17        | 637.50       | 23    | 885.50       | 25          | 847.50       | 40          | 1404.00      | 52      | 1404.00      | 1729.00     | 6356.10 |
| 186 | Ground Beef  | 67650          | 0.00177    | 28         | 852.60       | 17        | 637.50       | 23    | 885.50       | 25          | 847.50       | 41          | 1439.10      | 52      | 1439.10      | 1729.00     | 6391.20 |
| 187 | Chicken      | 77000          | 0.00176    | 28         | 852.60       | 17        | 637.50       | 23    | 885.50       | 25          | 847.50       | 41          | 1439.10      | 53      | 1439.10      | 1762.25     | 6424.45 |
| 188 | Oven Roast   | 52500          | 0.00170    | 29         | 883.05       | 17        | 637.50       | 23    | 885.50       | 25          | 847.50       | 41          | 1439.10      | 53      | 1439.10      | 1762.25     | 6454.90 |
| 189 | Pork chops   | 27000          | 0.00169    | 29         | 883.05       | 18        | 675.00       | 23    | 885.50       | 25          | 847.50       | 41          | 1439.10      | 53      | 1439.10      | 1762.25     | 6492.40 |
| 190 | Chicken      | 78400          | 0.00169    | 29         | 883.05       | 18        | 675.00       | 23    | 885.50       | 25          | 847.50       | 41          | 1439.10      | 54      | 1439.10      | 1795.50     | 6525.65 |
| 191 | Bacon        | 37800          | 0.00168    | 29         | 883.05       | 18        | 675.00       | 24    | 924.00       | 25          | 847.50       | 41          | 1439.10      | 54      | 1439.10      | 1795.50     | 6564.15 |
| 192 | Ground Beef  | 69300          | 0.00168    | 29         | 883.05       | 18        | 675.00       | 24    | 924.00       | 25          | 847.50       | 42          | 1474.20      | 54      | 1474.20      | 1795.50     | 6599.25 |
| 193 | Frankfurters | 31200          | 0.00165    | 29         | 883.05       | 18        | 675.00       | 24    | 924.00       | 26          | 881.40       | 42          | 1474.20      | 54      | 1474.20      | 1795.50     | 6633.15 |
| 194 | Chicken      | 79800          | 0.00162    | 29         | 883.05       | 18        | 675.00       | 24    | 924.00       | 26          | 881.40       | 42          | 1474.20      | 55      | 1474.20      | 1828.75     | 6666.40 |
| 195 | Ground Beef  | 70950          | 0.00159    | 29         | 883.05       | 18        | 675.00       | 24    | 924.00       | 26          | 881.40       | 43          | 1509.30      | 55      | 1509.30      | 1828.75     | 6701.50 |
| 196 | Bacon        | 39375          | 0.00157    | 29         | 883.05       | 18        | 675.00       | 25    | 962.50       | 26          | 881.40       | 43          | 1509.30      | 55      | 1509.30      | 1828.75     | 6740.00 |
| 197 | Chicken      | 81200          | 0.00155    | 29         | 883.05       | 18        | 675.00       | 25    | 962.50       | 26          | 881.40       | 43          | 1509.30      | 56      | 1509.30      | 1862.00     | 6773.25 |
| 198 | Ground Beef  | 72600          | 0.00151    | 29         | 883.05       | 18        | 675.00       | 25    | 962.50       | 26          | 881.40       | 44          | 1544.40      | 56      | 1544.40      | 1862.00     | 6808.35 |
| 199 | Oven Roast   | 54250          | 0.00150    | 30         | 913.50       | 18        | 675.00       | 25    | 962.50       | 26          | 881.40       | 44          | 1544.40      | 56      | 1544.40      | 1862.00     | 6838.80 |
| 200 | Chicken      | 82600          | 0.00149    | 30         | 913.50       | 18        | 675.00       | 25    | 962.50       | 26          | 881.40       | 44          | 1544.40      | 57      | 1544.40      | 1895.25     | 6872.05 |
| 201 | Bacon        | 40950          | 0.00146    | 30         | 913.50       | 18        | 675.00       | 26    | 1001.00      | 27          | 915.30       | 44          | 1544.40      | 57      | 1544.40      | 1895.25     | 6910.55 |
| 202 | Frankfurters | 32400          | 0.00146    | 30         | 913.50       | 18        | 675.00       | 26    | 1001.00      | 27          | 915.30       | 44          | 1544.40      | 57      | 1544.40      | 1895.25     | 6944.45 |
| 203 | Pork chops   | 28500          | 0.00145    | 30         | 913.50       | 19        | 712.50       | 26    | 1001.00      | 27          | 915.30       | 44          | 1544.40      | 57      | 1544.40      | 1895.25     | 6981.95 |
| 204 | Ground Beef  | 74250          | 0.00144    | 30         | 913.50       | 19        | 712.50       | 26    | 1001.00      | 27          | 915.30       | 45          | 1579.50      | 57      | 1579.50      | 1895.25     | 7017.05 |
| 205 | Chicken      | 84000          | 0.00143    | 30         | 913.50       | 19        | 712.50       | 26    | 1001.00      | 27          | 915.30       | 45          | 1579.50      | 58      | 1579.50      | 1928.50     | 7050.30 |
| 206 | Chicken      | 85400          | 0.00137    | 30         | 913.50       | 19        | 712.50       | 26    | 1001.00      | 27          | 915.30       | 45          | 1579.50      | 59      | 1579.50      | 1961.75     | 7083.55 |
| 207 | Ground Beef  | 75900          | 0.00137    | 30         | 913.50       | 19        | 712.50       | 26    | 1001.00      | 27          | 915.30       | 46          | 1614.60      | 59      | 1614.60      | 1961.75     | 7118.65 |
| 208 | Bacon        | 42525          | 0.00137    | 30         | 913.50       | 19        | 712.50       | 27    | 1039.50      | 27          | 915.30       | 46          | 1614.60      | 59      | 1614.60      | 1961.75     | 7157.15 |
| 209 | Oven Roast   | 56000          | 0.00132    | 31         | 943.95       | 19        | 712.50       | 27    | 1039.50      | 27          | 915.30       | 46          | 1614.60      | 59      | 1614.60      | 1995.00     | 7220.85 |
| 210 | Chicken      | 86800          | 0.00131    | 31         | 943.95       | 19        | 712.50       | 27    | 1039.50      | 27          | 915.30       | 46          | 1614.60      | 60      | 1614.60      | 1995.00     | 7255.95 |
| 211 | Ground Beef  | 77550          | 0.00130    | 31         | 943.95       | 19        | 712.50       | 27    | 1039.50      | 27          | 915.30       | 47          | 1649.70      | 60      | 1649.70      | 1995.00     | 7289.85 |
| 212 | Frankfurters | 33600          | 0.00130    | 31         | 943.95       | 19        | 712.50       | 27    | 1039.50      | 28          | 949.20       | 47          | 1649.70      | 60      | 1649.70      | 1995.00     | 7328.35 |
| 213 | Bacon        | 44100          | 0.00128    | 31         | 943.95       | 19        | 712.50       | 28    | 1078.00      | 28          | 949.20       | 47          | 1649.70      | 60      | 1649.70      | 1995.00     | 7361.60 |
| 214 | Chicken      | 88200          | 0.00126    | 31         | 943.95       | 19        | 712.50       | 28    | 1078.00      | 28          | 949.20       | 47          | 1649.70      | 61      | 1649.70      | 2028.25     | 7399.10 |
| 215 | Pork chops   | 30000          | 0.00125    | 31         | 943.95       | 20        | 750.00       | 28    | 1078.00      | 28          | 949.20       | 47          | 1649.70      | 61      | 1649.70      | 2028.25     | 7434.20 |
| 216 | Ground Beef  | 79200          | 0.00124    | 31         | 943.95       | 20        | 750.00       | 28    | 1078.00      | 28          | 949.20       | 48          | 1684.80      | 61      | 1684.80      | 2061.50     | 7467.45 |
| 217 | Chicken      | 89600          | 0.00121    | 31         | 943.95       | 20        | 750.00       | 28    | 1078.00      | 28          | 949.20       | 48          | 1684.80      | 62      | 1684.80      | 2061.50     | 7505.95 |
| 218 | Bacon        | 45675          | 0.00120    | 31         | 943.95       | 20        | 750.00       | 29    | 1116.50      | 28          | 949.20       | 48          | 1684.80      | 62      | 1684.80      | 2061.50     | 7505.95 |

| Pri | Item         | Eval Stk Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|
| 219 | Ground Beef  | 80850          | 0.00118    | 31         | 943.95       | 20        | 750.00       | 29    | 1116.50      | 28          | 949.20       | 49          | 1719.90      | 62      | 2061.50      | 7541.05     |
| 220 | Oven Roast   | 57750          | 0.00117    | 32         | 974.40       | 20        | 750.00       | 29    | 1116.50      | 28          | 949.20       | 49          | 1719.90      | 62      | 2061.50      | 7571.50     |
| 221 | Chicken      | 91000          | 0.00116    | 32         | 974.40       | 20        | 750.00       | 29    | 1116.50      | 28          | 949.20       | 49          | 1719.90      | 63      | 2094.75      | 7604.75     |
| 222 | Frankfurters | 34800          | 0.00115    | 32         | 974.40       | 20        | 750.00       | 29    | 1116.50      | 29          | 983.10       | 49          | 1719.90      | 63      | 2094.75      | 7638.65     |
| 223 | Bacon        | 47250          | 0.00113    | 32         | 974.40       | 20        | 750.00       | 30    | 1155.00      | 29          | 983.10       | 49          | 1719.90      | 63      | 2094.75      | 7677.15     |
| 224 | Ground Beef  | 82500          | 0.00112    | 32         | 974.40       | 20        | 750.00       | 30    | 1155.00      | 29          | 983.10       | 50          | 1755.00      | 63      | 2094.75      | 7712.25     |
| 225 | Chicken      | 92400          | 0.00111    | 32         | 974.40       | 20        | 750.00       | 30    | 1155.00      | 29          | 983.10       | 50          | 1755.00      | 64      | 2128.00      | 7745.50     |
| 226 | Pork chops   | 31500          | 0.00108    | 32         | 974.40       | 21        | 787.50       | 30    | 1155.00      | 29          | 983.10       | 50          | 1755.00      | 64      | 2128.00      | 7783.00     |
| 227 | Ground Beef  | 84150          | 0.00107    | 32         | 974.40       | 21        | 787.50       | 30    | 1155.00      | 29          | 983.10       | 51          | 1790.10      | 64      | 2128.00      | 7818.10     |
| 228 | Chicken      | 93800          | 0.00107    | 32         | 974.40       | 21        | 787.50       | 30    | 1155.00      | 29          | 983.10       | 51          | 1790.10      | 65      | 2161.25      | 7851.35     |
| 229 | Bacon        | 48825          | 0.00106    | 32         | 974.40       | 21        | 787.50       | 31    | 1193.50      | 29          | 983.10       | 51          | 1790.10      | 65      | 2161.25      | 7889.85     |
| 230 | Oven Roast   | 59500          | 0.00103    | 33         | 1004.85      | 21        | 787.50       | 31    | 1193.50      | 29          | 983.10       | 51          | 1790.10      | 65      | 2161.25      | 7920.30     |
| 231 | Chicken      | 95200          | 0.00103    | 33         | 1004.85      | 21        | 787.50       | 31    | 1193.50      | 29          | 983.10       | 51          | 1790.10      | 66      | 2194.50      | 7953.55     |
| 232 | Frankfurters | 36000          | 0.00103    | 33         | 1004.85      | 21        | 787.50       | 31    | 1193.50      | 30          | 1017.00      | 51          | 1790.10      | 66      | 2194.50      | 7987.45     |
| 233 | Ground Beef  | 85800          | 0.00102    | 33         | 1004.85      | 21        | 787.50       | 31    | 1193.50      | 30          | 1017.00      | 52          | 1825.20      | 66      | 2194.50      | 8022.55     |
| 234 | Bacon        | 50400          | 0.00100    | 33         | 1004.85      | 21        | 787.50       | 32    | 1232.00      | 30          | 1017.00      | 52          | 1825.20      | 66      | 2194.50      | 8056.05     |
| 235 | Chicken      | 96600          | 0.00099    | 33         | 1004.85      | 21        | 787.50       | 32    | 1232.00      | 30          | 1017.00      | 52          | 1825.20      | 67      | 2227.75      | 8094.30     |
| 236 | Ground Beef  | 87450          | 0.00097    | 33         | 1004.85      | 21        | 787.50       | 32    | 1232.00      | 30          | 1017.00      | 53          | 1860.30      | 67      | 2227.75      | 8129.40     |
| 237 | Chicken      | 98000          | 0.00095    | 33         | 1004.85      | 21        | 787.50       | 32    | 1232.00      | 30          | 1017.00      | 53          | 1860.30      | 68      | 2261.00      | 8162.65     |
| 238 | Bacon        | 51975          | 0.00094    | 33         | 1004.85      | 21        | 787.50       | 33    | 1270.50      | 30          | 1017.00      | 53          | 1860.30      | 68      | 2261.00      | 8201.15     |
| 239 | Pork chops   | 33000          | 0.00094    | 33         | 1004.85      | 22        | 825.00       | 33    | 1270.50      | 30          | 1017.00      | 53          | 1860.30      | 68      | 2261.00      | 8238.65     |
| 240 | Ground Beef  | 89100          | 0.00093    | 33         | 1004.85      | 22        | 825.00       | 33    | 1270.50      | 30          | 1017.00      | 54          | 1895.40      | 68      | 2261.00      | 8273.75     |
| 241 | Frankfurters | 37200          | 0.00091    | 33         | 1004.85      | 22        | 825.00       | 33    | 1270.50      | 31          | 1050.90      | 54          | 1895.40      | 68      | 2261.00      | 8307.65     |
| 242 | Chicken      | 99400          | 0.00091    | 33         | 1004.85      | 22        | 825.00       | 33    | 1270.50      | 31          | 1050.90      | 54          | 1895.40      | 69      | 2294.25      | 8340.90     |
| 243 | Oven Roast   | 61250          | 0.00091    | 34         | 1035.30      | 22        | 825.00       | 33    | 1270.50      | 31          | 1050.90      | 54          | 1895.40      | 69      | 2294.25      | 8371.35     |
| 244 | Bacon        | 53550          | 0.00089    | 34         | 1035.30      | 22        | 825.00       | 34    | 1309.00      | 31          | 1050.90      | 54          | 1895.40      | 69      | 2294.25      | 8409.85     |
| 245 | Ground Beef  | 90750          | 0.00089    | 34         | 1035.30      | 22        | 825.00       | 34    | 1309.00      | 31          | 1050.90      | 55          | 1930.50      | 69      | 2294.25      | 8444.95     |
| 246 | Chicken      | 100800         | 0.00088    | 34         | 1035.30      | 22        | 825.00       | 34    | 1309.00      | 31          | 1050.90      | 55          | 1930.50      | 70      | 2327.50      | 8478.20     |
| 247 | Ground Beef  | 92400          | 0.00085    | 34         | 1035.30      | 22        | 825.00       | 34    | 1309.00      | 31          | 1050.90      | 56          | 1965.60      | 70      | 2327.50      | 8513.30     |
| 248 | Bacon        | 55125          | 0.00084    | 34         | 1035.30      | 22        | 825.00       | 35    | 1347.50      | 31          | 1050.90      | 56          | 1965.60      | 70      | 2327.50      | 8551.80     |
| 249 | Chicken      | 102200         | 0.00084    | 34         | 1035.30      | 22        | 825.00       | 35    | 1347.50      | 31          | 1050.90      | 56          | 1965.60      | 71      | 2360.75      | 8585.05     |
| 250 | Frankfurters | 38400          | 0.00081    | 34         | 1035.30      | 22        | 825.00       | 35    | 1347.50      | 32          | 1084.80      | 56          | 1965.60      | 71      | 2360.75      | 8618.95     |
| 251 | Pork chops   | 34500          | 0.00081    | 34         | 1035.30      | 23        | 862.50       | 35    | 1347.50      | 32          | 1084.80      | 56          | 1965.60      | 71      | 2360.75      | 8656.45     |
| 252 | Ground Beef  | 94050          | 0.00081    | 34         | 1035.30      | 23        | 862.50       | 35    | 1347.50      | 32          | 1084.80      | 57          | 2000.70      | 71      | 2360.75      | 8691.55     |
| 253 | Chicken      | 103600         | 0.00081    | 34         | 1035.30      | 23        | 862.50       | 35    | 1347.50      | 32          | 1084.80      | 57          | 2000.70      | 72      | 2394.00      | 8724.80     |
| 254 | Oven Roast   | 63000          | 0.00080    | 35         | 1065.75      | 23        | 862.50       | 35    | 1347.50      | 32          | 1084.80      | 57          | 2000.70      | 72      | 2394.00      | 8755.25     |

| Pri | Item         | Eval Slt Level | Eval Ratio | Oven Roast | Space/Pallet | Pork Chop | Space/Pallet | Bacon | Space/Pallet | Frankfurter | Space/Pallet | Ground Beef | Space/Pallet | Chicken | Space/Pallet | Total Space |
|-----|--------------|----------------|------------|------------|--------------|-----------|--------------|-------|--------------|-------------|--------------|-------------|--------------|---------|--------------|-------------|
| 255 | Bacon        | 56700          | 0.00080    | 35         | 1065.75      | 23        | 862.50       | 36    | 1386.00      | 32          | 1084.80      | 57          | 2000.70      | 72      | 2394.00      | 8793.75     |
| 256 | Chicken      | 105000         | 0.00078    | 35         | 1065.75      | 23        | 862.50       | 36    | 1386.00      | 32          | 1084.80      | 57          | 2000.70      | 73      | 2427.25      | 8827.00     |
| 257 | Ground Beef  | 95700          | 0.00077    | 35         | 1065.75      | 23        | 862.50       | 36    | 1386.00      | 32          | 1084.80      | 58          | 2035.80      | 73      | 2427.25      | 8862.10     |
| 258 | Bacon        | 58275          | 0.00076    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 32          | 1084.80      | 58          | 2035.80      | 73      | 2427.25      | 8900.60     |
| 259 | Chicken      | 106400         | 0.00075    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 32          | 1084.80      | 58          | 2035.80      | 74      | 2460.50      | 8933.85     |
| 260 | Ground Beef  | 97350          | 0.00074    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 32          | 1084.80      | 59          | 2070.90      | 74      | 2460.50      | 8968.95     |
| 261 | Frankfurters | 39600          | 0.00072    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 33          | 1118.70      | 59          | 2070.90      | 74      | 2460.50      | 9002.85     |
| 262 | Chicken      | 107800         | 0.00072    | 35         | 1065.75      | 23        | 862.50       | 37    | 1424.50      | 33          | 1118.70      | 59          | 2070.90      | 75      | 2493.75      | 9036.10     |
| 263 | Bacon        | 59850          | 0.00072    | 35         | 1065.75      | 23        | 862.50       | 38    | 1463.00      | 33          | 1118.70      | 59          | 2070.90      | 75      | 2493.75      | 9074.60     |
| 264 | Oven Roast   | 64750          | 0.00071    | 36         | 1096.20      | 23        | 862.50       | 38    | 1463.00      | 33          | 1118.70      | 59          | 2070.90      | 75      | 2493.75      | 9105.05     |
| 265 | Ground Beef  | 99000          | 0.00071    | 36         | 1096.20      | 23        | 862.50       | 38    | 1463.00      | 33          | 1118.70      | 60          | 2106.00      | 75      | 2493.75      | 9140.15     |
| 266 | Pork chops   | 36000          | 0.00071    | 36         | 1096.20      | 24        | 900.00       | 38    | 1463.00      | 33          | 1118.70      | 60          | 2106.00      | 75      | 2493.75      | 9177.65     |
| 267 | Chicken      | 109200         | 0.00069    | 36         | 1096.20      | 24        | 900.00       | 38    | 1463.00      | 33          | 1118.70      | 60          | 2106.00      | 76      | 2527.00      | 9210.90     |
| 268 | Bacon        | 61425          | 0.00068    | 36         | 1096.20      | 24        | 900.00       | 39    | 1501.50      | 33          | 1118.70      | 60          | 2106.00      | 76      | 2527.00      | 9249.40     |
| 269 | Ground Beef  | 100650         | 0.00068    | 36         | 1096.20      | 24        | 900.00       | 39    | 1501.50      | 33          | 1118.70      | 61          | 2141.10      | 76      | 2527.00      | 9284.50     |
| 270 | Chicken      | 110600         | 0.00066    | 36         | 1096.20      | 24        | 900.00       | 39    | 1501.50      | 33          | 1118.70      | 61          | 2141.10      | 77      | 2560.25      | 9317.75     |
| 271 | Bacon        | 63000          | 0.00065    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 33          | 1118.70      | 61          | 2141.10      | 77      | 2560.25      | 9356.25     |
| 272 | Ground Beef  | 102300         | 0.00065    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 33          | 1118.70      | 62          | 2176.20      | 77      | 2560.25      |             |
| 273 | Frankfurters | 40800          | 0.00065    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 62          | 2176.20      | 77      | 2560.25      |             |
| 274 | Chicken      | 112000         | 0.00064    | 36         | 1096.20      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 62          | 2176.20      | 78      | 2593.50      |             |
| 275 | Oven Roast   | 66500          | 0.00062    | 37         | 1126.65      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 62          | 2176.20      | 78      | 2593.50      |             |
| 276 | Ground Beef  | 103950         | 0.00062    | 37         | 1126.65      | 24        | 900.00       | 40    | 1540.00      | 34          | 1152.60      | 63          | 2211.30      | 78      | 2593.50      |             |
| 277 | Bacon        | 64575          | 0.00062    | 37         | 1126.65      | 24        | 900.00       | 41    | 1578.50      | 34          | 1152.60      | 63          | 2211.30      | 78      | 2593.50      |             |
| 278 | Chicken      | 113400         | 0.00061    | 37         | 1126.65      | 24        | 900.00       | 41    | 1578.50      | 34          | 1152.60      | 63          | 2211.30      | 79      | 2626.75      |             |
| 279 | Pork chops   | 37500          | 0.00061    | 37         | 1126.65      | 25        | 937.50       | 41    | 1578.50      | 34          | 1152.60      | 63          | 2211.30      | 79      | 2626.75      |             |
| 280 | Ground Beef  | 105600         | 0.00059    | 37         | 1126.65      | 25        | 937.50       | 41    | 1578.50      | 34          | 1152.60      | 64          | 2246.40      | 79      | 2626.75      |             |
| 281 | Chicken      | 114800         | 0.00059    | 37         | 1126.65      | 25        | 937.50       | 41    | 1578.50      | 34          | 1152.60      | 64          | 2246.40      | 80      | 2660.00      |             |
| 282 | Bacon        | 66150          | 0.00059    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 34          | 1152.60      | 64          | 2246.40      | 80      | 2660.00      |             |
| 283 | Frankfurters | 42000          | 0.00058    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 35          | 1186.50      | 64          | 2246.40      | 80      | 2660.00      |             |
| 284 | Chicken      | 116200         | 0.00057    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 35          | 1186.50      | 64          | 2246.40      | 81      | 2693.25      |             |
| 285 | Ground Beef  | 107250         | 0.00057    | 37         | 1126.65      | 25        | 937.50       | 42    | 1617.00      | 35          | 1186.50      | 65          | 2281.50      | 81      | 2693.25      |             |
| 286 | Bacon        | 67725          | 0.00056    | 37         | 1126.65      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 65          | 2281.50      | 81      | 2693.25      |             |
| 287 | Oven Roast   | 68250          | 0.00055    | 38         | 1157.10      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 65          | 2281.50      | 81      | 2693.25      |             |
| 288 | Chicken      | 117600         | 0.00055    | 38         | 1157.10      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 65          | 2281.50      | 82      | 2726.50      |             |
| 289 | Ground Beef  | 108900         | 0.00054    | 38         | 1157.10      | 25        | 937.50       | 43    | 1655.50      | 35          | 1186.50      | 66          | 2316.60      | 82      | 2726.50      |             |
| 290 | Pork chops   | 39000          | 0.00054    | 38         | 1157.10      | 26        | 975.00       | 43    | 1655.50      | 35          | 1186.50      | 66          | 2316.60      | 82      | 2726.50      |             |

## LIST OF REFERENCES

1. Tersine, R. J., *Principles of Inventory and Materials Management*, 4th Edition, pp. 320-325, Prentice-Hall, Inc., 1994.
2. Blanchard, B. S., *Logistics Engineering and Management*, 4th Edition, p. 33, Prentice-Hall, Inc., 1992.
3. Maurice, C.; Thomas, C. R.; Smithson, C. W., *Managerial Economics - Applied Microeconomics for Decision Making*, 4th Edition, pp. 373-380, Richard D. Irwin, Inc., 1992.



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